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A REVIEW OF THE CHÆTODONTIDÆ AND RELATED FAMILIES OF FISHES FOUND IN THE WATERS OF JAPAN.

BY

DAVID STARR JORDAN

AND

HENRY W. FOWLER,

Of the Leland Stanford Junior University.

From the Proceedings of the United States National Museum, Vol. XXV, pages 513-563.

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In the present paper an account is given of the Japanese fishes belonging to the *Chætodontidæ* and to the more or less closely related families of *Zeidæ*, *Antigoniidæ*, *Platacidæ*, *Acanthuridæ*, and *Siganidæ*. The account is based on material collected in 1900 by Jordan and Snyder under the auspices of the Hopkins Seaside Laboratory of Stanford University, in connection with the series in the United States National Museum, and some specimens collected by the U. S. Fish Commission steamer *Albatross*.

The families included in this paper may be thus distinguished:

a. Ventral rays, I, 6 to I, 8; scales minute or wanting; pubic bone short; post-temporal firmly attached to the skull.

aa. Ventral rays, I, 5 ..... ZEIDÆ, I.

b. Teeth very small, not brush-like nor united; gill-membranes separate, free from isthmus; pelvis very long; scales ctenoid ..... ANTIGONIIDÆ, II.

bb. Teeth elongate, brush-like or incisor-like; gill-membranes united to the broad scaly isthmus; soft scaly fins.

c. Post-temporal bifurcate or trifurcate, not united with the skull; teeth slender, hardly brush-like; maxillary distinct; dorsal spines not separated from the soft rays; body very deep; soft dorsal, anal, and ventrals much elevated ..... PLATACIDÆ, III.

cc. Post-temporal apparently simple, firmly united to the skull; dorsal fin continuous.

d. Teeth brush-like, setiform, thick-set; post-temporal with a foramen which is usually fully perforate; carnivorous fishes with the intestinal canal short; the caudal peduncle unarmed and the pubic bone not greatly developed; maxillary distinct.

e. Scales well developed ..... CHÆTODONTIDÆ, IV.

ee. Scales reduced to minute asperities; some of the dorsal spines filamentous ..... ZANCLIDÆ, V.

dd. Teeth incisor-like, in a single series; post-temporal with a foramen which does not pass through the bone; scales minute, rough; herbivorous fishes with the intestinal canal elongate; the caudal peduncle usually armed with spines or tubercles; maxillary and premaxillary immovably united; post-temporal united with skull; pubic bones very long, bent, firmly attached to each other ..... ACANTHURIDÆ, VI.

aaa. Ventral rays, I, 3, I; anal spines, seven; dorsal spines thirteen; scales minute, cycloid; teeth incisor-like ..... SIGANIDÆ, VII.

Family I. ZEIDÆ.

JOHN DORIES.

Body short, deep, much compressed and elevated, naked or covered with minute, smooth scales, or with bony protuberances. Mouth large, terminal, the upper jaw protractile. Teeth small, in narrow bands or single series on the jaws and vomer, and sometimes on the palatines. Eyes lateral, placed high; opercle much reduced; some of the bones of head usually with spines; preopercle not serrate. Post-temporal very firmly attached to the skull; lower limb adnate for its whole length; the distal end only of its upper limb is attached. The supra-clavicle short and trianglar, bearing a short spine near its anterior angle, its posterior edge divided into three spines, two or three of which stand out above the surface of the skin. Ventral edge often serrate, with strong bony plates. Lateral line well developed, concurrent with the back. Branchiostegals, 7 or 8. Gill-openings wide, the membranes little united, free from the isthmus. Pseudobranchiæ large. Air bladder large. Gill rakers usually short; gills 4, no slit behind the fourth. Dorsal fin emarginate or divided, the anterior part with spines, which are often strong, the posterior part longer, its highest rays behind the middle; soft anal entirely similar to soft dorsal, usually preceded by 1 to 4 spines, which are not graduated and which often form a separate fin; pubic bone short; ventral fins thoracic, well developed, their rays usually I, 6 to I, 8; pectorals small; caudal fin rounded, on a moderate peduncle. Lateral line obscure, unarmed. Pyloric cæca exceedingly numerous. Vertebræ about 32 (*Zeus*). Fishes of singular appearance, inhabiting warm seas, often at considerable depth. The species undergo great changes in the course of development. The "John Dory" (*Zeus faber*) is a well-known food-fish of southern Europe. The increased number of ventral rays and the armature of the belly in this family suggest relationship with the Berycoids; the adnate post-temporal suggests the Chætodonts. We follow Mr. Starks in associating the *Zeidæ* with the Chætodonts, removing them from all association with the Scombroid forms, to which they bear only the most superficial resemblance. The actual place of *Zeus* in the system is still uncertain, but it should not be separated far either from the Berycoids or the Chætodonts.

a. Dorsal spines very strong, sometimes filamentous; anal spines 3 or 4. Bony spinous plates present along bases of vertical fins, and between ventrals and anal.

b. Anal spines 3; both dorsals with strong bony spinous plates at base; ventral rays I, 6, or I, 7 ..... *Zenopsis*, 1.

bb. Anal spines 4; no plates at base of spinous dorsal; scales evident .... *Zeus*, 2.

bbb. Anal spines 2, the first strong, immovable; bony plates very small; scales obsolete ..... *Cyttopsis*, 3.

1. ZENOPSIS Gill.

Zenopsis GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 126 (*nebulosus*).

Body ovate, much compressed, without scales and without warts or humps in the adult. Head deeper than long, its anterior profile steep. Mouth rather large, upper jaw protractile; teeth small on jaws and vomer, none on the palatines. Various bones of the head and shoulder girdle armed with spines. Series of bony plates along the sides of the belly and the bases of both dorsal and anal, each plate armed with a strong spine with radiating striæ at the base. Gill rakers short. Dorsal spines very strong, usually 10 in number, some of them filamentous; anal spines 3; ventral fins long, the rays I, 6, or I, 7. Caudal peduncle slender, the fin not forked. This genus differs from *Zeus* mainly in the presence of 3 anal spines instead of 4, and in the greater development of the spinous armature.

(*Ζήν*, a poetic form of *Ζεύς*, Jupiter; *ὄψις*, appearance.)

1. ZENOPSIS NEBULOSA (Schlegel).

KAGAMIDAI (MIRROR TAI OR PERCH).

Zeus nebulosus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 123, pl. LXVI; Nagasaki.—GÜNTHER, Cat. Fish, II, 1860, p. 395; Japan.—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1884, p. 14; Tokyo.—NYSTROM, Svensk. Ak. Handl., 1887, p. 32; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 43; Tokyo.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 359; Tokyo.

Head $2\frac{1}{2}$; depth $1\frac{2}{5}$. D. IX or 10–27; A. III–25; P. 12; V. 1–6. Body short, deep, compressed and elevated. No scales; the skin naked and smooth; 12 to 14 bony bucklers along the base of the dorsal fin on each side, each armed with a short curved spine, which is directed outward and backward, and marked with radiating ridges; along the abdominal ridge of the body from the gill-opening are a series of bony bucklers on each side, which are 3 before ventrals, 8 between the latter and anal, and 7 or 8 along the base of the anal; the dorsal bucklers are smallest at base of spinous dorsal, becoming enlarged at the middle of the soft dorsal; the bucklers before ventral are very small, the middle ones between the base of the ventral and anal and along the base of the latter the largest. Head long, deep, and obliquely quadrangular, the upper profile concave; snout short; eye moderate, high, $1\frac{1}{2}$ to $1\frac{2}{3}$ in snout, $3\frac{2}{3}$ to 4 in total length of the head, and $1\frac{1}{2}$ to $1\frac{2}{3}$ in maxillary; anterior margin of eye nearer the posterior margin of the opercle than the tip of the snout; mouth large, deep, obliquely vertical, and with the mandible protruding; the maxillary broad distally for about three-fifths to two-thirds the diameter of the eye, and not extending posteriorly below in front of the eye; lips very broad and thin; teeth small in both jaws and directed inward; nostrils close together, directly in

front of the eye, and the posterior very much larger than the anterior; above the eye a number of small denticles in a single series on each side; distal extremities of the articulars produced into two small spines below; dentaries with two small spines at the symphasis below; edge of preoperculum very long and oblique and the angle very obtuse and rounded; top of head with two ridges between the eyes, the interorbital space two-thirds to five-sixths in the eye. Gill-opening very large, its lower margin at least twice that of the upper; gill rakers short, stumpy, rounded, and few; no slit behind the fourth gill-arch.

Origin of spinous dorsal behind the eye; the spines thick and strong, terminating in long, thread-like filaments, and highest anteriorly; origin of soft dorsal about over the first anal spine, the fin, like the soft anal, with the posterior rays the longer; anal spines graduated from the first, which is the largest and only a little longer than the eye; pectoral a trifle in advance of the base of the first dorsal spine, about equal to the snout, and with its upper rays the longer; ventrals a little in front of the middle of the eye, $1\frac{2}{3}$ to $1\frac{3}{4}$ in body, the middle rays the longest and the innermost the shortest; caudal short, the edge convex, and 2 to $2\frac{1}{3}$ in the ventrals. Lateral line much arched in front, descending to the sides posteriorly and then running straight. Caudal peduncle very narrow and compressed, from one-half to three-fifths the eye. Color in alcohol, silvery brown, dark on back and upper part of head, inclining to silver white below; filaments of spinous dorsal brownish black, blotches on the membranes above dark brown; ventrals, dark brownish, becoming darker distally, the outer portion blackish and with 5 dark blackish cross-bands; caudal with the outer portion with a dusky blotch; body marked with a number of large brownish spots or blotches on the sides, which are most distinct in the smaller examples; in all the specimens traces on sides behind gill-openings of a blackish, ocellated spot; caudal peduncle dark above and 2 dark spots at the base of the side in the 2 small examples. Here described from Misaki specimens; the largest collected by Professor Otaki measures $4\frac{11}{16}$ inches.

This species is rare on the coast of Japan, being found in rather deep water. We have two specimens, one from Tokyo, the other from Misaki.

(*nebulosus*, clouded.)

2. ZEUS Linnæus.

Zeus Linnæus, Syst. Nat., 10th ed., 1758, p. 137 (*faber*; includes *Selene*, *Alectis*, *Zeus*, *Capros*).

Body ovate, much compressed, covered with small rudimentary scales. Head deeper than long, its profile steep. Mouth large, the upper jaw protractile; small teeth on jaws and vomer, none on palatines; preopercle unarmed; a series of spinous plates between ventrals

and anal; a series of bony plates along base of soft dorsal and anal, none along spinous dorsal; each plate armed with a pair of spines. Gill rakers short. Dorsal fins separate, near together; dorsal spines high and strong, some of them filamentous; anal spines 4; ventral rays 1, 7. Species rather few, fishes of remarkable appearance, all of the Old World, and all marked by a round black spot in the middle of the side.

(*Ζεύς*, Jupiter, the common John Dory having been called "*Piscis Jovii.*")

2. ZEUS JAPONICUS Cuvier and Valenciennes.

KANETATAKI (GONG RINGER); MATODAI (TARGET PERCH); MATOUWO (TARGET FISH).

Poisson à Miroir du Japon TILESIUS, Krusensterns' Reise, Atlas, about 1809, pl. LI, fig. 1; Japan.

Zeus japonicus CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 1835, p. 24 (on a Japanese drawing).—SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 123, pl. LXVI A.; Nagasaki (*Zeus faber japonicus* on plate).—BLEEKER, Verh. Bat. Gen., XXVI, 1857, Japan, p. 165.—NYSTROM, Svensk. Vet. Ak. Handl., 1887, p. 32; Nagasaki.—ISHIKAWA, Prel. Cat. 1897, p. 43; Tokyo, Boshu, Nagasaki.—STEINDACHNER, Reise Aurora, 1898, p. 211; Kobe.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 359; Tokyo.

Head $2\frac{1}{2}$; depth 2. D. X–23, A. IV–22, P. 14, V. I–7; scales 15–110–80. Body compressed, deep, and covered with small cycloid scales; no bucklers along the base of the spinous dorsal; along the base of the soft dorsal 7 bony bucklers, and all but the first with 2 short, strong, thorn-like spines, the inner the larger, compressed in front or above, directed backward, and the outer short, directed backward, outward, or slightly forward; 6 similar spines along the base of the anal on each side; along the abdominal ridge of the body, from the gill-opening, are a series of bony bucklers on each side, which are 6 before the ventrals and 3 more in the middle between each series, 8 between the latter and the anal; all the bucklers smooth without radiating ridges, and, except those along the soft dorsal and anal, with a single low, short spine directed backward. Head long, deep, greatly compressed, the upper profile convex; snout a little over 2 in the head; eye rather small, $2\frac{1}{4}$ in snout, $4\frac{1}{2}$ in head, and $2\frac{2}{5}$ in maxillary; anterior margin of eye nearer the tip of the snout than the posterior margin of the opercle; mouth large, deep, obliquely vertical, and with the mandible protruding; the maxillary broad distally, equal to three-fourths the eye, and extending posteriorly below the posterior nostril; lips very broad and thin; teeth small in the jaws and directed inward; nostrils close together and directly in front of the eye, the posterior very much larger than the anterior; 2 spines behind the eye and above its center, but the top of the head smooth and without any spines over the eyes; distal extremities of the articulars produced into 2 small

spines below; quadrate with a small spine below and behind the end of the maxillary; dentaries with 2 small spines at the symphysis below; edge of the preoperculum very long and oblique, the angle exceedingly obtuse and rounded; top of the head with 2 ridges between the eyes, the interorbital space two-thirds of the eye. Gill-opening very large, its lower margin three times that of the upper; gill rakers short, stumpy, and rounded, 5+8; no slit behind the fourth gill-arch.

Origin of spinous dorsal a little before the posterior margin of the operculum, the spines thick, strong, and elongated, terminating in long, thread-like filaments, and with their bases on each side, except the first and last two, with a single short spine projecting backward; the spinous dorsal high anteriorly; soft dorsal and anal gradually becoming higher posteriorly, the origin of the former behind that of the latter and the origin of the latter under the sixth dorsal spine; anal spines, except the first, with basal spines like those on the spinous dorsal; the first anal spine shorter than the second, which is the longest, and 3 in the head, and the others both still shorter, the last being the shortest; pectoral rather short, in advance of the spinous dorsal, but posterior to the posterior margin of the eye, rounded, and with its upper rays the longer; ventrals long, expanded, below the posterior part of the eye, the spine more than half the length of the fin and the innermost ray the shortest; ventrals $1\frac{2}{5}$ in head and reaching the base of the second anal spine; caudal with the margin convex and its length $1\frac{3}{4}$ in head. Lateral line very high in front, descending posteriorly to the sides and then running straight to the base of the caudal. Caudal peduncle compressed and about equal to the eye. Color in alcohol, brown, darker above; the spinous dorsal blackish brown, with indistinct darker spots; spinous anal with its lower borders and the ventral fins blackish; on the sides are about 9 indistinctly defined dark brownish bars running longitudinally, becoming reticulated somewhat as their course is interrupted by a large dark ocellus on the sides a short distance behind the opercles; the lateral ocellus marked with a smaller and darker ring inside; a dark spot at the base of the caudal; caudal dusky on the outer border. In small and young examples the spinous dorsal is more or less distinctly spotted, and there are traces of several bands across the caudal. Here described from a large specimen from Tokyo, which measures $12\frac{1}{4}$ inches.

This species is close to the John Dory of Europe (*Zeus faber* Linnæus), differing mainly in the reduced number of bony plates. In color and habit the two species are very similar. The species is a common inhabitant of the bays of southern Japan, being taken in shallow water at almost every haul of the net.

Our specimens are from Tokyo, Misaki, Kobe, Hiroshima, Tsuruga, and Nagasaki.

3. CYTTOPSIS Gill.

Cyttopsis Gill, Proc. Ac. Nat. Sci. Phila., 1862, p. 126 (*roseus*); no description.

Body ovate, much compressed, with rudimentary scales; mouth rather small, the upper jaws extremely protractile; teeth small on jaws and vomer; preopercle entire; supraorbital ridges serrated; gill rakers very short; dorsal spines strong, not filamentous; ventral rays I, 7. Anal with two short spines more or less coalescent into a knife-like spine; knife-like spines on the median line between ventral fins and vent; spinous scales at base of soft dorsal and anal very small or obsolete, not shield-like, about one for each ray, none at base of spinous dorsal. Silvery fishes of the open seas, differing from *Zeus* in the absence of bony plates, and from *Cyttus* in having knife-like spines between ventrals and anal.

(*cyttus*, κυττός name of an unknown fish; ὄψις, appearance.)

3. CYTTOPSIS ITEA Jordan and Fowler, new species.

Head [$2\frac{1}{3}$]:[1] depth [$2\frac{1}{4}$].[1] D. VII, 30; A. I, 30; P. 14; V. I, 9; scales 82. Body deep, compressed, and covered with small cycloid scales; a series of bony tubercles forming a ridge or keel, and covered with thin skin, along the bases of the soft dorsal and anal, and about equal in number to the fin rays; along the abdomen, from the gill-opening to the anus, a single series of bucklers, 7 in number, the last three being very large, and each with a single backwardly directed spine; region between and in front of the ventrals flattened and broad, anteriorly forming an angle just behind the gill-opening, which is furnished with several small denticles; all the bucklers are smooth and without striæ. Head deep, the upper profile of the snout and space between the eyes and origin of the dorsal concave; eye very large and high in the head [2 in the snout, $1\frac{2}{5}$ in maxillary, and $3\frac{1}{2}$ in the head]:[1] mouth large and deep, the maxillary broad distally, equal to one half the eye; lips very broad and thin, the width of the upper equal to the width of the maxillary; teeth small, fine, and in broad bands in the jaws, those above very broad; nostrils close together, superior and directly in front of the eye, the anterior rounded and the posterior a slit twice as long; above the eyes a series of anteriorly directed small denticles on each side of the head; top of the head with some of the bones striated and covered with thin skin; dentaries with 2 small spines at the symphysis below; edge of the preopercle very long and oblique, the angle exceedingly obtuse and rounded; interorbital space concave and equal to one-half the eye. Gill-opening very large; branchiostegal rays, 7; gill rakers short and stumpy, 11 in number; no slit behind the fourth gill arch.

Origin of the spinous dorsal behind the gill-opening, the spines

[1] The brackets indicate that such measurements, etc., as are given are not satisfactory, owing to the distorted snout of this specimen.

thick, short, strong, sharp, not terminating in filaments; third and fourth dorsal spines the longest and a little greater than the eye; first dorsal spine a little shorter than the fifth; anal with a single, compressed, short, tooth-like spine hooked backward and falling behind the origin of the soft dorsal; soft dorsal and anal similar, the anterior rays graduated to behind the middle of the fin, where it is highest; pectorals before the spinous dorsal, directly behind the gill-opening, and about equal to the eye; ventrals a trifle before pectorals, long, expanded, a little larger than the base of the soft dorsal, and with a very short spine at their bases; caudal damaged, short, about 1⅓ times larger than the eye, and its base edged above and below with 3 short, sharp spines. Lateral line strongly arched in front and descending obliquely behind

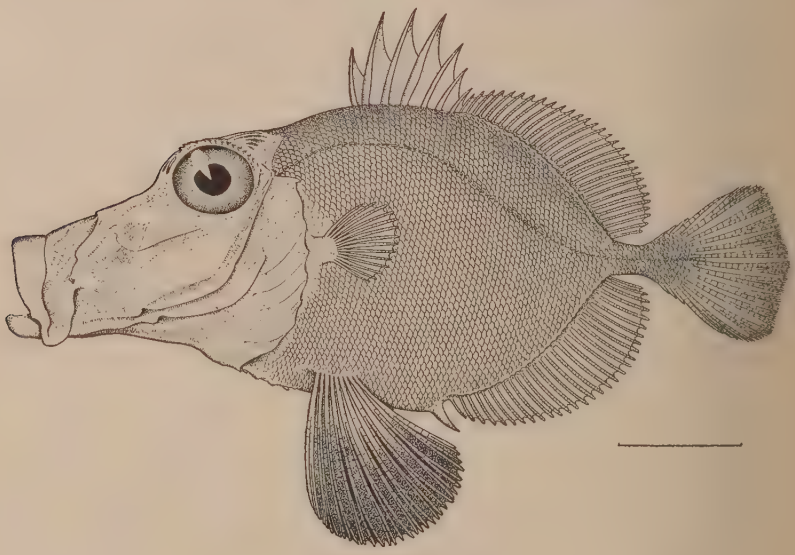

FIG. 1.—CYTTOPSIS ITEA.

at the caudal peduncle and then running straight to the base of the caudal. Caudal peduncle very narrow and somewhat thick and compressed, and a little less than the maxillary. Color in alcohol, brown above, silvery below, and all the fins except the ventrals plain; ventrals, with their outer halves of the membranes of the fin, brownish black, the rays being pale; on the outer parts of the membranes of the spinous dorsal some dark brownish black. [Total length, 6¼ inches.][1]

Here described from an example dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay. It is numbered 50562 in the United States National Museum.

(*ἰτέα*, a target.)

[1] The brackets indicate that such measurements, etc., as are given are not satisfactory, owing to the distorted snout of this specimen.

Family II. ANTIGONIIDÆ.[1]

BOARFISHES.

Body compressed and elevated, covered with small, ctenoid scales; sides of head scaly; preorbital and preopercle more or less serrate or armed; opercle small; gills normal; gill-membranes separate, free from isthmus; top of head bony; premaxillaries very protractile, the posterior process very long; mouth moderate, the lower jaw projecting; the teeth very small; lateral line not extending on caudal; dorsal fin long, the stout spines separated from the soft rays by a deep notch; dorsal spines not graduated; anal fin with three spines separated by a notch from the soft rays, the first spine longest; soft part of anal as long as soft dorsal; ventrals I, 5, the spine strong, inserted below pectorals; caudal fin rounded, on a moderate peduncle. Upper limb of the post-temporal widened at its distal end, which affords a very firm attachment; the lower limb short and thick. The supraclavicle long and slender, its posterior edge sharply serrate, the serrations standing out above the surface of the skin. Vertebræ in normal number, 10+13=23 (*in Capros*). Species few, arranged in 2 genera, living in rather deep water. *Capros aper*, the Boarfish, superficially resembles the John Dory, *Zeus faber*, and is common on the coasts of southern Europe. This family, like the preceding, is of doubtful affinities. It is only remotely allied to the *Zeidæ*, and it has no relationship to the *Carangidæ* or other Scombroid forms. *Antigonia* bears much superficial resemblance to the *Ephippidæ*, a resemblance doubtless arising from real affinity, as is shown by the form and attachment of the post-temporal. An extinct genus, *Proantigonia*, is said to connect *Antigonia* with *Capros*.

a. Lateral line complete. Body deeper than long, covered with rough scales.
  b. Teeth slender, in jaws only; anal spines strong.....*Antigonia*, 4.

4. ANTIGONIA Lowe.

Antigonia Lowe, Proc. Zool. Soc. Lond., 1843, p. 85 (*capros*).
Capreophonus Müller and Troschel, Horæ Ichthyologicæ, III, 1845, p. 28 (*aurora*).
Hypsinotus Schlegel, Fauna Japonica, Poiss., 1847, p. 34, pl. XLII, fig. 2 (*rubescens*).

Body very deep, the depth much greater than the length of body, which is excessively compressed and covered with moderate-sized, firm, rough ctenoid scales; profile from nape to dorsal very steep and nearly straight. Surface of head above with rough bony striæ; preopercle and suborbital bones armed with slender antrorse spines;

[1] We use the name *Antigoniidæ* in preference to *Capridæ*, as *Capridæ*, derived from *Capra*, is applied to the family of Goats. *Caproidæ* used by Gill seems hardly admissible.

mouth small, its cleft nearly vertical; premaxillary with a very long process, so that it is extremely protractile, perhaps less so than in *Capros;* lower jaw projecting; upper jaw somewhat protractile; maxillary broad, scaly; small, very slender teeth on jaws in one row, none on palate; chin rough; preopercle with rough striæ, becoming antrorse spines below; cheeks deep, covered with rough scales; opercle short, scaly. Branchiostegals 6; gill-membranes separate, free from isthmus. Lateral line concurrent with the back. Fin spines stiff and strong. Dorsals united, the third spine stout and elevated, the sixth or last spine shortest, lower than the soft rays; the fin is thus distinctly notched. Soft dorsal and anal similar, long and low, none of the rays produced; anal spines 3, joined to the fin, the first longest. Base of dorsal and anal with a sheath of small, rough scales extending on the fin spines and slightly on the rays, not on the membranes; caudal peduncle short and deep, deeper than long; caudal short, squarely truncate; ventrals strong, of moderate length, at lowest point of ventral outline, well behind pectorals and directly below spinous dorsal, which is at its highest point of dorsal outline; ventral spine large, roughened anteriorly; pectorals moderate, not falcate. Species few, in waters of moderate depth.

(*Ἀντιγόνεια*, a city founded by Antigonus, the allusion not evident.)

a. Dorsal rays VIII, 36; anal III, 33; snout very short ..... *steindachneri*, 4.
aa. Dorsal rays IX, 27; anal III, 26; snout more produced ..... *rubescens*, 5.

4. **ANTIGONIA STEINDACHNERI** Jordan and Evermann, MS., new species.

HISHIDAI (DIAMOND TAI); YOKODAI (CROSSWISE TAI).

? *Antigonia capros* LOWE, Proc. Zool. Soc. London, 1843, p. 85; Madeira.
? *Caprophonus aurora* MÜLLER and TROSCHEL, Horæ Ichthyologicæ, III, 1845, p. 28, pl. v, fig. 1; Barbados.
Antigonia capros STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 10, fig. 5; Tokyo, not of Lowe.—ISHIKAWA, Prel. Cat., 1897, p. 41; Tokyo.

Head 3; depth (greater with age and always more than the length of the body) exceeds the length of the body by half an eye diameter. D. VIII–36; A. III–33; P. I, 13; V. I, 5; scales 15–59–41. Body covered with rough ctenoid scales, very deep and elevated, the back forming a sharp angle at an equal distance from the tip of the snout and the caudal peduncle in front, the apex forming the origin of the spinous dorsal; below the profile of the body is hemispherical. Head deep, the upper profile convex from the tip of the snout and then becoming concave over the eye in front; snout two-thirds the eye and equal to the interorbital space; eye large in the upper part of the head and $2\frac{1}{2}$ in its length; maxillary short, broad, the width equal to one-third the eye, the length 4 in the head, not extending to the lower margin and not reaching the anterior margin of the eye; preorbital

edge denticulate; mouth small, vertical, and with small teeth in each jaw; nostrils high, directly in front and level with the upper part of the eye, and close together; 5 rows of scales on the cheeks, and opercles with scales; each articular with 2 small denticles; head roughened and striated above and on the preoperculum, which is rounded and denticulate below. Gill-opening rounded, large, beginning about level with the middle of the eye; gill rakers about half as long as the gill-filaments and in moderate number; a small slit behind the fourth gill-arch.

First and second dorsal spines very short, the third the largest, equal to the eye and snout, then the others are graduated to the last, which is longer than the first and second; soft dorsal and soft anal similar, low and highest in front; origin of spinous anal below that of the spinous dorsal, graduated from the first spine, which is equal to the eye; pectorals in the lower third of the body, behind the gill-opening and with the upper longest rays three times the length of the inner; ventrals with a strong spine equal to the third dorsal spine, though the longest fin rays are still longer; caudal truncate with angular corners and a little longer than the third dorsal spine. Lateral line arched in front, then descending obliquely to the sides of the caudal peduncle and running straight to the base of the caudal. Color in alcohol pale brown, with traces of a dark streak from the beginning of the lateral line on the sides of the body backwards; membranes of ventral fins marked with brownish. Total length, $6\frac{11}{16}$ inches. Here described from a specimen from Kailua, island of Hawaii. Color in life salmon-pink, nape, back of head, and down ventrals deeper red, behind the bar from dorsal to ventral a paler shade; iris red; fins pale crimson, the caudal paler, with darker red tip.

This species is rather common in deep water about the Hawaiian Islands, specimens having been taken by Jordan and Evermann at Hilo, Kailua, and Honolulu. It has been once recorded from Japan and very well figured by Dr. Steindachner, who identified it with *Antigonia capros* of the West Indies and Madeira. The two species are closely related, but apparently distinct. *Antigonia rubescens* is a very different fish from *A. capros*, as is also the Australian *Antigonia mülleri*.

(Named for Dr. Franz Steindachner.)

5. ANTIGONIA RUBESCENS (Günther).

BENIHATATATE (RED FLAG RAISER).

Hypsinotus (?) SCHLEGEL, Fauna Japonica, 1847, p. 84, pl. XLII, fig. 2; Nagasaki.

Hypsinotus rubescens GÜNTHER, Cat. Fish., II, 1860, p. 63, copied.—GÜNTHER, Shore Fishes of the Challenger, 1880, p. 44; Manado, Ki Islands, Japan (confused with *A. steindachneri*).

Hypsinotus benhatatate BLEEKER, Poiss. Connues du Japon, 1879, p. 9 (name only).

Head $2\frac{3}{4}$; depth (greater in young) less than half the length of the body by $\frac{3}{4}$ the diameter of the eye. D. IX–26 to 28; A. III–26; P. I–12; V. I–5; scales 14–60–40. Body covered with rough ctenoid scales, very deep and elevated, the back forming a sharp angle nearer the caudal peduncle than the tip of the snout, and the apex forming the origin of the spinous dorsal; below with the profile rounded and

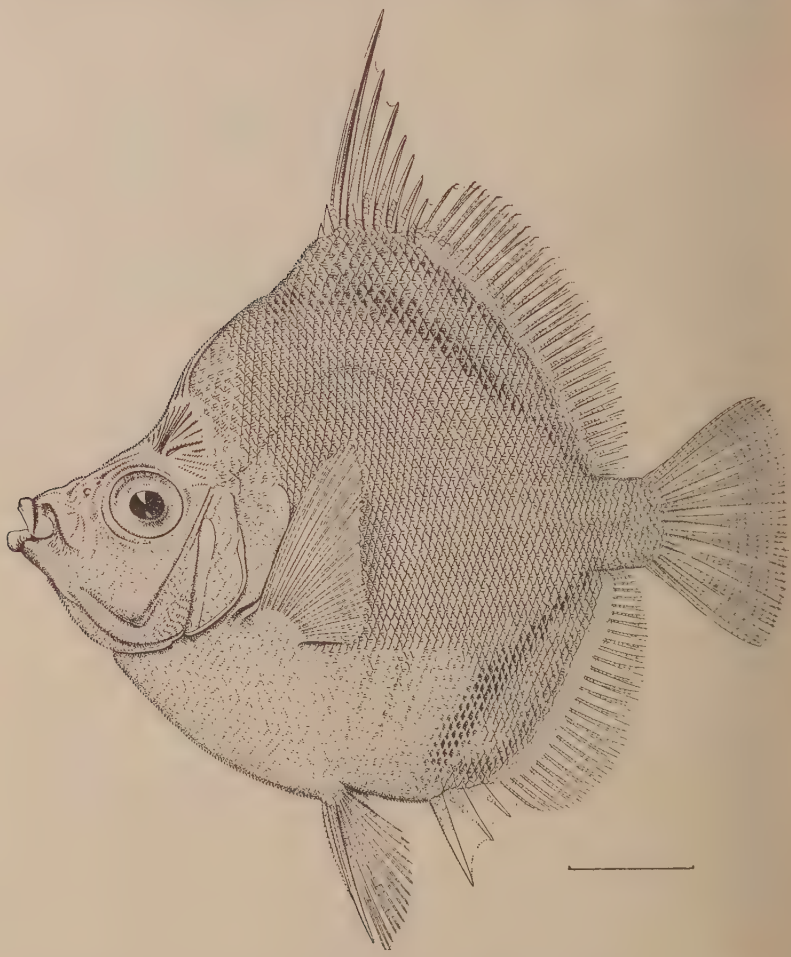

FIG. 2.—ANTIGONIA RUBESCENS.

somewhat produced in the region of the spinous anal. Head deep, very concave above, the supra-occipital process forming a lump; snout equal to the eye, greater than the interorbital space; eye large, in the middle of the length of the head, in which it is contained 3 times; maxillary short, not very broad, not as far posterior as the anterior nostril, the width equal to one-third the eye, the length $4\frac{1}{4}$ in the head.

and extending below the lower margin of the eye; preorbital edge denticulate; mouth small, nearly vertical and with small teeth in each jaw; nostrils high, directly in front and level with the upper part of the eyes, and close together; 6 rows of scales on the cheeks, and opercles with scales; articulars with denticles; head roughened and striated above, and on operculum which is rounded and denticulate below. Gill-opening rounded, large, beginning about level with the eye; gill rakers short, mostly less than half the length of the gill-filaments and in moderate number; a small slit behind the fourth gill-arch.

First and second dorsal spines very short, the third the longest, equal to the head, then the others graduated to the last, which is larger than the first and second; soft dorsal and soft anal similar, low and highest in front; origin of anal behind that of the soft dorsal, graduated from the first spine, which is longer than the eye; pectorals in the lower third of the body behind the gill-opening and with the longest upper rays three times the length of the inner; ventrals with a strong spine 1⅓ in the third dorsal spine, and the longest fin rays extending little beyond its tip; caudal truncate, with angular corners, and 1½ in the third dorsal spine. Lateral line arched in front, then descending obliquely to the sides of the caudal peduncle and running straight to the base of the caudal. Color in alcohol pale brown, with a dark streak from some distance below the origin of the spinous dorsal to the caudal peduncle and a similar one from near the spinous anal to the base of the caudal peduncle below. Total length 6¼ inches. Here described from specimens dredged by the U. S. Fish Commission steamer *Albatross* at Stations 3717 and 3730, in Totomi Bay.

In young specimens the body is as deep as long without the caudal, and in an example 2½ inches long from the Imperial Museum, taken at Misaki, the depth of the body exceeds its length.

This species is found in abundance in the deeper parts of the Japanese bays. Our numerous specimens were dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay at Station 3707, at Station 3730, 34 fathoms, and at Station 3715 in 64 fathoms; in Totomi Bay, Stations 3734 and 3729 (34 fathoms). Another, taken at Misaki, was presented to us by Professor Mitsukuri. The fish is orange-scarlet in life, somewhat paler anteriorly. The species differs in many regards from *Antigonia capros* and *A. steindachneri*, notably in the much smaller number of dorsal and anal rays. Günther, Steindachner, and most recent writers have confounded the two, *Antigonia rubescens* having remained unknown since the time of Schlegel.

(*rubescens*, turning red.)

FAMILY III. PLATACIDÆ.

Body compressed, greatly elevated, the anterior profile steep, the caudal peduncle short. Scales small, ctenoid, densely covering the soft parts of the vertical fins; lateral line present, following the curve

of the back. Mouth small, terminal, horizontal; premaxillaries slightly protractile; maxillary short, without supplemental bone, jaws with bands of slender, pointed, movable, brush-like teeth; nostrils double; preopercle entire; gill-membranes broadly attached to the broad scaly isthmus, the openings restricted to sides; branchiostegals 6 or 7; pyloric cæca few; gill rakers very short; pseudobranchiæ present. Dorsal fin continuous, 5 or 6 spines graduated and closely attached to the soft rays; soft dorsal and anal fins anteriorly high, their bases thickened by the scales; anal spines 3, graduated; caudal fin truncate; pectorals short, the rays all branched; ventrals thoracic, I, 5, usually elongate but sometimes rudimentary; a large accessory scale as in the *Sparidæ;* air bladder large. Vertebræ 10 + 14 = 24. Post-temporal probably bifurcate and not solidly joined to the skull. A small group of fishes of the Asiatic seas related to the *Chætodontidæ* but showing differences in the skeleton. We here include with the *Platacidæ* the genus *Monodactylus* (= *Psettus* Cuvier), which has the general characters of the *Platacidæ*, but the ventrals are rudimentary. The body is still deeper than in *Platax*.

5. PLATAX Cuvier.

Platax Cuvier, Regne Animal, 1st ed., I, 1817, p. 334 (*teira*).

Characters of the genus included above; the ventral fins well developed, the rays I, 5.

(πλατύς, broad.)

a. Dorsal with 28 to 34 soft rays; anal with 24 to 28; anterior profile rather evenly curved, without angle; 35 to 45 scales between first dorsal spine and lateral line; dorsal spines 5; teeth on the vomer in young individuals only . . . *teira*, 6.

6. PLATAX TEIRA (Forskål).

TSUBAMEUWO (SWALLOW FISH); TSUBAKURODAI (SWALLOW PERCH OR TAI).

Chætodon teira Forskål, Descript. Animal, 1775, p. 60; Lohajæ.

Chætodon teira Cuvier, Règne Animal, 1st ed., 1817, p. 354.—Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 226; Malabar.—Cantor, Malayan Fish, 1850, p. 168.—Günther, Cat. Fish., II, 1860, p. 492; Moluccas, Borneo, Ceram, China, Pinang.—Kner, Novara Fische, 1866, p. 166.—Klunzinger, Fische Rothen Meeres, 1870, p. 791.—Bleeker, Atlas, Ichth. Chaet., 1877–78, p. 73, pl. xvii, fig. 2; Sumatra, Batu-Nias, Pinang, Singapore, Bintang, Bangka, Cocos, Jaya, Madura, Bewean, Borneo, Celebes, Sumbawa, Timor, Ternate, Batjan, Ceram, Amboina, Goram, New Guinea.—Ishikawa, Prel. Cat., 1897, p. 41; Riukiu, Bonin Islands, Kagoshima (also No. 749, p. 43; Tokyo).

Chætodon daakar Bonnaterre, Ichth., p. 81, pl. xcv, pl. cccclxxxix, 1788; Malabar (after *Chætodon teira* Bloch).

Chætodon arthriticus Bell, Philos. Trans., 1793, p. 8, pl. vi; Sumatra.

Platax arthriticus, Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 229; Java.—Günther, Cat. Fish., II, 1860, p. 492; Amboyna, Pinang.

Platax albipunctatus Rüppell, Atlas N. A. Fische, 1828, p. 69, pl. xviii, fig. 1; Red Sea.

Platax gaimardi CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 216; New Guinea.

Platax leschenaldi CUVIER and VALENCIENNES Hist. Poiss., VII, 1831, p. 223; Pondicherry, New Guinea.

Platax punctulatus CUVIER and VALENCIENNES Hist. Poiss., VII, 1831, p. 228; Timor.

Platax vespertilio japonicus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 83, pl. XLIII; Nagasaki.

Platax xanthopus BLEEKER, Verh. Bat. Gen., XXIII, Chaet., 1850, p. 28; Batavia, Java.—GÜNTHER, Cat. Fish., II, 1860, p. 490.

Platax boersi BLEEKER, Derde Bijtr. Celebes, III, 1852, p. 758; Macassar, Celebes.—GÜNTHER, Cat. Fish., II, 1860, p. 490.

Platax anagou MONTROUSIER, Fauna Woodlark, 1857, p. 170; Woodlark Island.

Platax teira JORDAN and EVERMANN, Proc. U. S. Nat. Mus., XXV, 1902, p. 356; Formosa.

Head 3; depth greater than the length by the depth of the caudal peduncle. D. V–32; A. III–26; P. I–16; V. I–7; scales 28–75–46. Body very deep and compressed, very much elevated both above and below, and covered with small ctenoid scales which extend over the bases of the vertical fins where they become reduced in size and very numerous. Head deep, its anterior profile very steep; snout hardly projecting, straight; eyes high, $1\frac{1}{4}$ in snout, $3\frac{1}{5}$ in head and $1\frac{1}{5}$ in interorbital space; mouth small, the maxillary not reaching beyond the posterior nostril, its distal extremity as broad as the space between the anterior and posterior nostrils, which is two-fifths the eye; teeth in jaws slender, compressed, the edges notched or denticulate, and in bands; scales on the cheeks very small; nostrils about equal, the anterior pair level with the middle of the eye and the posterior pair above but directly in front of the margin of the eye; interorbital space convex. Origin of the dorsal in front of that of the anal, the spines graduated to the last which is the longest and joined to the soft dorsal; soft dorsal exceedingly long, the anterior rays from the first graduated to the last and higher than the depth of the body; anal spines graduated and joined to the soft anal which is similar to the soft dorsal except that it is lower; pectoral short, $1\frac{1}{3}$ in the head, below the gill-opening and behind the ventrals; ventrals under the posterior part of the eye, very long, extending posteriorly to the base of the caudal; caudal broad. Lateral line slightly arched to the base of the caudal. Caudal peduncle compressed, and $1\frac{1}{2}$ in the pectoral. Length without the caudal $5\frac{3}{4}$ inches. Here described from a young dried example from Miyako.

Notes on a specimen in the Imperial Museum are as follows:

Head 4; depth $1\frac{2}{3}$. D. IV–31 or 32; A. III 23; scales 73, small and largest on the middle of the sides. Profile nearly verticle, high at the nape. Preopercle entire; preorbital deep; eye 4 in head; maxillary $3\frac{1}{2}$ in head; teeth equal, brush-like and also on the vomer. Gill-membranes joined to the isthmus. Dorsal spines rudiments along the front of the dorsal; soft dorsal and anal higher than the length of the

head and scaly at base; pectoral short, $1\frac{1}{3}$ in the head; ventrals equal the head; caudal lunate and equal to the head. Color lost. Lateral line complete. Length $17\frac{3}{4}$ inches (450 mm.).

This, the adult form, is well figured by Bleeker, differing from the young chiefly in the lower fins.

This species, very abundant in the East Indies and along the southern coasts of China, is taken occasionally in the Kuro Shiwo off the coast of Japan. Besides a number of specimens from Formosa, we have a single one, obtained off Miyako in Rikuchu, in Northern Japan, presented to us by Mitonobu Irako, director of the museum at Morioka. In the Imperial Museum at Tokyo are specimens from Tokyo, Kagoshima, the Riukiu, and the Bonin Islands. In the Imperial University is one from Okinawa and one from Kezen.

According to Bleeker, this species is distinguished from *Platax vespertilio* (Bloch) by its smaller scales. In *Pl. vespertilio* there are 20 to 25 scales between the lateral line and the first dorsal spine. The dorsal rays in the latter are about V, 36.

(*orbicularis*, round.)

Family IV. CHÆTODONTIDÆ.

BUTTERFLY-FISHES.

Body strongly compressed, elevated, suborbicular in outline, covered with moderate-sized or small scales, which are finely ciliated or nearly smooth; lateral line present, concurrent with the back, not extending on the caudal fin; mouth small, protractile, terminal; maxillary very short, irregular in form, divided in two by a longitudinal suture; upper part of skull solid, occipital crest strong; post-temporal firmly joined to the skull, its form really trifurcate, though appearing simple, the interspaces between the forks filled in by bone so that only a foramen is left; last bone of suborbital ring firmly joined to the preoperculum; teeth brush-like or setiform, often extremely long, in narrow bands in the jaws; no teeth on vomer or palatines; no canines, molars, or incisors; eyes lateral, of moderate size; branchiostegals 6 or 7; pseudobranchiæ very large; air bladder present. Gill-membranes more or less attached to the isthmus; gill rakers very small. Dorsal fin single, continuous, its rays sometimes filamentous, its soft part as well as the soft part of the anal densely covered with small scales; anal similar to the soft dorsal with 3 or 4 spines; ventrals thoracic, I, 5; caudal usually truncate. Vertebræ 10+14=24, the anterior abbreviated; insertion of the ribs inferior; post-temporal usually reduced, and not bifurcate. Carnivorous fishes of the tropical seas, noted for their bright colors and great activity. The excessive quickness of sense and motion enable these fishes to maintain themselves in the struggle for existence in the close competition of the

coral reefs, notwithstanding their bright colors. The young are very different from the adult and pass through a stage termed *Tholichthys* in which the membranes are greatly developed, forming collars and sheaths about the head and neck. The Japanese name *Chochouwo*, or Butterfly-fish, like the Spanish name *Mariposa*, corresponds to our commonest English designation for these fishes.

Chætodontinæ:

a. Preopercle unarmed; scales comparatively large (young with the *Tholichthys* form).

b. Snout little if at all produced; dorsal spines 10 to 14, not graduated, some of the middle ones highest; anal spines 3.

c. Dorsal spines, none of them elevated or filiform.

d. Scales large, usually 35 to 50 in the lateral line.

e. Dorsal spines 12 to 14; teeth moderate; dorsal and anal with the base not strongly angulate ..... *Chætodon*, 6.

ee. Dorsal spines 8 to 11; teeth very small; dorsal and anal strongly angulate at base so that the greater part of the base of each fin is vertical. *Coradion*, 7.

dd. Scales rather small, about 60 in the lateral line; dorsal spines 10 or 12. *Microcanthus*, 8.

cc. Dorsal fin with the fourth spine much elevated and filiform; scales moderate; forehead in the adult with bony projections ..... *Heniochus*, 9.

Pomacanthinæ:

aa. Preopercle armed at its angle with a very strong spine, which is sometimes grooved.

f. Interopercle short and broad, armed with 1 to 4 strong spines; preopercle serrate or spinous; dorsal spines about 14, graduated, the last one longest; scales rather small; isthmus very narrow; vertical limb of preopercle simply serrate, with 10 to 30 small teeth; body oblong, rather robust. *Holacanthus*, 10.

6. CHÆTODON (Artedi) Linnæus.

CHOCHOUWO OR BUTTERFLY FISHES.

Chætodon Artedi, Genera, 1738, p. 51 (numerous species, the first one mentioned belonging to *Pomacanthus;* nonbinomial).

Tetragonoptrus Klein, Historia Piscium, 1744, p. 37 (many species; *striatus*, etc.; nonbinomial).

Chætodon Linnæus, Systema Naturæ, 10th ed., 1758, p. 272 (includes all known *Chætodontidæ*).

Chætodon Cuvier, Règne Animal, 2d ed., 1829, p. 189 (*striatus, capistratus;* first restriction of the name to the present group).

Rabdophorus Swainson, Class'n Fishes, II, 1839, p. 21 (*ephippium;* scales on lower half in nearly horizontal series; scales about 45).

Citharædus Kaup, Wiegmann's Archiv., XXVI, Pt. 1, 1860, p. 141 (*meyeri;* scales on lower half of body in horizontal series; scales small, about 50).

Linophora Kaup, Wiegmann's Archiv., 1860, XXVI, Pt. 1, 1860 (*auriga;* scales in series running downward and backward).

Sarothrodus Gill, Proc. Ac. Nat. Sci. Phila., 1862, p. 238 (*Chætodon* Cuvier, *not* Artedi; offered as a substitute for *Chætodon*, the latter name being transferred to *Pomacanthus*).

Tholichthys Günther, Ann. Mag. Nat. Hist., 1868, p. 457 (*osseus;* larval form).

Tetragonoptrus BLEEKER, Rev. Famille Chætodontoides, 1877, p. 52 (*striatus;* scales below in horizontal series; spinous dorsal not more than half longer than soft).

Chætodontops BLEEKER, Rev. Famille Chætodontoides, 1877, p. 53 (scales on lower parts in ascending series).

Hemichætodon BLEEKER, Rev. Famille Chætodontoides, 1877, p. 53 (*capistratus;* scales below running downward and backward, forming an angle with those above).

Lepidochætodon BLEEKER, Rev. Famille Chætodontoides, 1877, p. 54 (*unimaculatus;* scales anteriorly much enlarged).

Gonochætodon BLEEKER, Rev. Famille Chætodontoides, 1877, p. 54 (*triangulum;* body very deep; the base of posterior half of soft dorsal and anal vertical).

Oxychætodon BLEEKER, Atlas Ichth. Chæt., 1877–78, p. 51 (*lineolatus;* scales very large, snout pointed).

Chætodon JORDAN and GILBERT, Synopsis, 1883, p. 614 (restriction to *capistratus*).

Anisochætodon KLUNZINGER, Fische des Rothen Meeres, 1884, p. 54 (*auriga*).

Body short, deep, very strongly compressed, especially above and behind; head small, compressed, almost everywhere scaly; mouth very small, terminal, the jaws provided with long, slender, flexible, bristle-like teeth; vomer sometimes with teeth; preoperculum entire or nearly so, without spine. Dorsal fin single, continuous, not notched, the spinous part longer than the soft part, of 12 or 13 spines, the spines not graduated, some of the middle ones being longer than the last; last rays of soft dorsal usually rapidly shortened, some of them occasionally filamentous; caudal peduncle short, the caudal fin fan-shaped; anal similar to soft dorsal, with 3 strong spines. Body covered with rather large ctenoid scales, somewhat irregular in their arrangement; the lateral line curved, high, parallel with the back. Gill-openings rather narrow, the membranes narrowly joined to the isthmus; branchiostegals 6. A very large genus of singular and beautiful fishes, abounding in the tropical seas, especially about volcanic rocks and coral reefs; most of them have the body crossed by transverse black bars. They are all very active, feeding on small animals.

(χαίτη, bristle; ὀδούς, tooth.)

a. LINOPHORA: Rows of scales and dark stripes on anterior part of body sloping downward and forward, meeting posteriorly almost at a right angle with similar rows and stripes running downward and backward; a black ocular bar; dorsal rays XII, 23 to XIII, 25; anal rays III, 20 to 25; scales about 45.

b. Dorsal with a soft ray in front produced in a filament; soft dorsal with a black ocellus ..... *setifer*, 7.

bb. Dorsal without produced soft ray; no dorsal ocellus ..... *vagabundus*, 8.

aa. Rows of scales of lower part of body horizontal or nearly so; no lines meeting at a sharp angle; scales about 45.

c. CHÆTODONTOPS: Rows of scales on lower parts in series ascending behind; a dark ocular bar, but no crossbar on body; dark streaks on sides, forked at their tips; no ocellus; ventrals yellow; D. XII, 23; A. III, 20. *collaris*, 9.

cc. Rows of scales nearly horizontal, not emphasized by longitudinal streaks.

d. RABDOPHORUS: Ocular region with a distinct crossbar.

e. Anal rays about III, 21; dorsal rays, XII, 25; soft dorsal with a black ocellus; sides with faint brown crossbars ..... *modestus*, 10.

ee. Anal rays about III, 17; dorsal rays XII, 20; body nearly plain, its posterior part dark; no ocellus ..... *nippon*, 11.

dd. Ocular region without distinct dark cross-band; whole body black, mottled with golden; no ocellus; dorsal rays XIII, 22; anal rays III, 16 ..... *dædalma*, 12.

7. CHÆTODON SETIFER Bloch.

Chætodon auriga FORSKÅL, Descr. Anim., 1775, p. 60; Djedda and Lobaia, Red Sea.—? CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 79; Massuah.—? GÜNTHER, Cat. Fish., II, 1860, p. 7; Red Sea.—? KLUNZINGER, Fische des Rothen Meeres, 1870, p. 775.

Tetragonopterus auriga BLEEKER, Atlas Ichth., 1877–78, p. 47, pl. II, fig. 4; Sumatra, Java, Bewean, Cocos, Celebes, Flores, Timor, Ceram, Amboyna, etc.

Chætodon setifer BLOCH, Ichth., XII, 1797, p. 99, pl. CCCCXXVI, fig. 1; Coromandel.—CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 76; Bolabola.—GÜNTHER, Cat. Fish., II, 1860, p. 6; Ile de France, Amboina, China, Aneitum.—GÜNTHER, Fische Südsee, I, 1873, p. 36, pl. XXVI, fig. B.—ISHIKAWA, Prel. Cat., 1897, p. 53; Miyakoshima.

Chætodon auriga var. setifer DAY, Fish. India, I, 1875, p. 106, pl. XXVII, fig. 3; Nicobar Islands.

Pomacentrus filamentosus LACÉPÈDE, Hist Poiss., IV, 1803, p. 511 (after *Ch. setifer* Bloch).

? ? *Chætodon mesogallicus* CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 63; Ile de France.—GÜNTHER, Cat. Fish., II, 1860, p. 10; Amboina.

Chætodon sebanus CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 57; Timor, Guam, Tongo, Ile de France, Java.

Chætodon lunaris GRONOW, Cat. Fish., Ed. Gray, 1854, p. 70; India.

Head $2\frac{2}{3}$ to 3; depth $1\frac{1}{2}$; D. XII or XIII, 23 to 26; A. III, 21; P. I, 15; V. I, 5; scales 4–44–15. Body short, deep, and strongly compressed; scales large on the sides, small on the head, soft dorsal and anal, and the base of the caudal. Head small; profile very steep; snout produced and pointed; eye large, equal to the snout, and 3 in the head; mouth shorter than the eye, the maxillary not extending backward as far as its anterior margin; nostrils small, in front of the eye; teeth curved and projecting in brush-like bands, in each jaw; interorbital space convexly flattened; gill-opening long, the membrane not united, but forming a fold across the isthmus; gill rakers few, very short and weak; dorsal spines robust and strong anteriorly, but shorter than the last, which are slender; soft dorsal forming an angle in the middle, the sixth and seventh spines produced beyond all the others into a point; first and second anal spines robust, the first half the length of the second, and the third slender and about equal to or a trifle longer than the second; soft anal with the middle rays very long and its edge rounded; pectorals low, as long as the ventrals and shorter than the head; ventrals pointed, the spine as long as the last dorsal spine; caudal truncate, the corners sharp. Lateral line very high and convex, concurrent with the margin of the dorsal fin, indistinct on the sides of the caudal peduncle. Caudal peduncle a trifle deeper than the length of the eye.

Color in spirits pale-brown, a little darker above; a dark-brown vertical band through the eye, equal to its width, and margined with white narrowly in front; 7 or 8 narrow, oblique, dark stripes sloping forward from the base of the dorsal till they meet on the sides; a series of 10 similar bands obliquely sloping in the reverse direction: edge of soft dorsal with a narrow dark-brown margin, below which and adjoining is a narrow white stripe; a large blackish-brown ocellus nearly as large as the eye in the upper corner of the soft dorsal behind the elongated rays; margin of soft anal pale with a narrow white line, above and adjoining is a narrow dark-brown line; about the middle of the caudal is a broad white bar, narrowly edged with brown. Here described from specimens from Okinawa, Riukiu. Length 4 inches.

This species is very abundant throughout the tropical Pacific Ocean from the Red Sea to the Hawaiian Islands. We have received 2 specimens from Nafa, in Okinawa, from Yonekichi Koneyama.

Bleeker identifies *Chætodon setifer* with *Chætodon auriga* without raising any question. But in *Chætodon auriga* the black dorsal marking is not a spot, as in *setifer*, but becomes an "oblique cuniform blackish band from the origin of the soft dorsal to the posterior part of the anal." This certainly indicates specific distinction. *Chætodon nesogallicus*, also included by Bleeker under *Ch. auriga*, has a broad band across the tail, the soft dorsal and the anal, with a white ring on the dorsal part. This is probably the young of *auriga*. The figures of Bleeker and Day represent *Chætodon setifer*, not *Chætodon auriga*. Cuvier and Valenciennes describe *Chætodon auriga* as "a *Chætodon setifer* without ocellus on the dorsal," a difference which is probably valid for distinction.

(*seta*, bristle; *fero*, to bear.)

8. CHÆTODON VAGABUNDUS Linnæus.

Chætodon vagabundus LINNÆUS, Mus. Adolph Frid., 1754, p. 71; Syst. Nat., 10th ed., I, 1758, p. 276; India (after *Chætodon vestratus, fascia nigra transoculos*).—CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 50; Ile de France, Vanicolo, Amboina.—GÜNTHER, Cat. Fish., II, 1860, p. 25; Mauritius, Amboina.—GÜNTHER, Fische Südsee, I, 1873, p. 43.—DAY, Fish. India, I, 1875, p. 105, pl. XXVII, fig. 1; Andamans.

Tetragonopterus vagabundus BLEEKER, Atl. Ichth. Chæt., 1877-78, p. 49, pl. XVI, fig. 1; Sumatra, Java, Celebes, Menado, Sumbawa, Timor, Bouro, Ceram, Amboina, etc.

? *Chætodon pictus* FORSKÅL, Descr. Anim., 1775, p. 65; Moka, Red Sea.—GÜNTHER, Cat. Fish., IV, 1860, p. 24; Madras.—DAY, Fishes India, I, 1875, p. 105, pl. XXVI, fig. 2; Andamans.

? *Chætodon decussatus* CUVIER and VALENCIENNES, Hist. Poiss., VII, 1831, p. 54; Pondicherry.

Head $2\frac{3}{4}$; depth $1\frac{2}{3}$; D. XIII, 25; A. III, 20; P. I, 15; V. I, 5; scales about 5–45–12. Body short, deep, and strongly compressed;

scales very large on the sides and becoming minute on the soft dorsal, anal and the base of the caudal. Head small, the profile very steep; snout produced and pointed; eye large, equal to the snout and $2\frac{3}{4}$ in the head; mouth shorter than the eye; the maxillary not reaching below the posterior nostril; the nostrils very small and in front of the eye; teeth curved and projecting in brush-like bands, in each jaw; interorbital space slightly convex; gill-opening long; the membrane not united but forming a fold across the isthmus; gill rakers few, short and weak; dorsal spines robust, and strong in front, where they are shorter than the last, which are long and slender; soft dorsal with the middle rays the longest and rounded; first and second anal spines robust, the first a little over half the length of the second, and the third slender and about equal to the second; middle rays of soft anal produced and the edge of the fin rounded; pectorals as long as the head; ventrals long, nearly under the pectorals, and the first soft ray produced into a long point so that the fin is longer than the pectorals; upper caudal rays the longest; the edge of the fin obliquely straight. Lateral line high, very much arched, concurrent with the margin of the dorsal fin, and descending on the sides of the caudal peduncle to the tail. Caudal peduncle compressed till its depth is equal to the eye.

Color in spirits pale-brown, darker above; a dark-brown vertical band through the eye, equal to its width, and narrowly margined with white in front; 6 narrow oblique stripes sloping forward from the base of the dorsal till they meet on the sides a series of 11 similar bands, obliquely sloping in a reverse direction; edge of the soft dorsal with a narrow white margin; below this a deep-brown band broadest at the longest rays, and then below this white to the broad vertical dark-brown bar, which extends from the upper part of the anterior soft rays across the fin, the caudal peduncle, and down on the anal; margin of the anal white with a narrow brown band near the edge; base of the caudal with a deep-brown crescent. The above description from a specimen taken in Okinawa, Riukiu, $2\frac{7}{16}$ inches long.

This species, very abundant in the East Indian Archipelago, and from the Red Sea to Polynesia, is known as a Japanese fish from a small specimen taken at Nafa, in Okinawa, by Yonekichi Koneyama, of Tokyo, and presented by him to the museum of Stanford University.

Dr. Bleeker unites *Chætodon pictus* (= *decussatus*) with this species, stating that the black bands on dorsal and anal are sometimes widened, covering the whole fin. Our specimen is typical of *Chætodon vagabundus*, agreeing with Day's figure.

(*vagabundus*, wandering.)

9. CHÆTODON COLLARIS Bloch.

CHOCHOUWO, BUTTERFLY-FISH; UCHIWADAI (FAN, PERCH).

Chætodon collaris BLOCH, Ichth., 1785, pl. CCXVI, fig. 1; Japan.—CUVIER and VALENCIENNES, Hist. Poiss., 1831, VII, p. 53, (copied, not *Chætodon* or *Tetragonopterus collaris*, Bleeker, which is an East Indian species with dusky ventrals).

Chætodon aureus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 81, pl. XLII, fig. 1; Nagasaki (not *Chætodon aureus* Black).—RICHARDSON, Ichth. China, 1846, p. 246; Canton.—GÜNTHER, Cat. Fish., II, 1860, p. 29, copied.—ISHIKAWA, Prel. Cat., 1897, p. 52; Tokyo, Sagami Bay, Kagoshima.

Chætodon auripes JORDAN and SNYDER, Check List, 1900, p. 90 (substitute for *aureus*, preoccupied).

Head $3\frac{2}{5}$; depth $1\frac{2}{5}$; D. XII, 23; A. III, 20; P. I, 15; V. I, 5; scales about 45 (squamation damaged). Body short, deep, and strongly com-

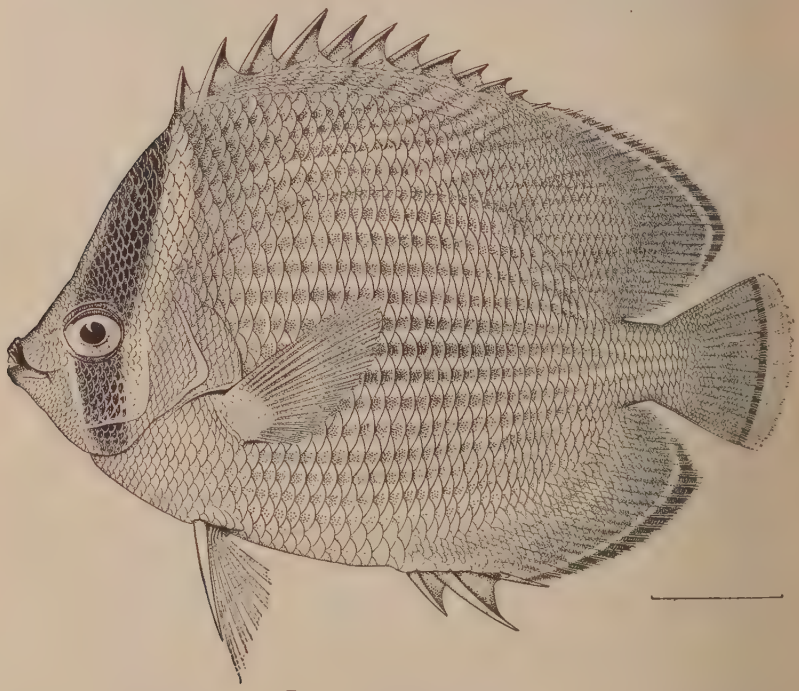

FIG. 3.—CHÆTODON COLLARIS.

pressed; scales large on the sides, small on the head, soft dorsal and anal, and the base of the caudal. Head small, the profile very steep; snout produced and pointed; eye a little greater than the snout and 3 in the head; mouth small, the maxillary extending to the first nostril; nostrils small, close together and in front of the eye; teeth curved and projecting in brush-like bands in each jaw; interorbital space convex; gill-opening long, the membrane a narrow free fold across

the isthmus; gill rakers few, short and weak; dorsal spines strong, the middle the longest and the posterior slender but longer than the first two; soft dorsal with a blunt angle behind the middle, due to the greater elongation of the rays; first anal spine short, and with the second, which is as long as the third, strong and thick, the third slender; anal fin with an angle behind the middle similar to soft dorsal; pectoral equal to the head, low in the body; ventral with the first ray long and pointed and shorter than the pectorals; caudal truncate, with pointed corners. Lateral line high, arched, and concurrent with the edge of the dorsal fin, descending on the caudal peduncle to the tail.

Color in spirits pale brown; a broad vertical band through the eye, blackish brown, margined narrowly in front below the eye and posteriorly along its whole length by a broad band of silvery white; ventral fins dark brown, the edges and a narrow band near the edges white; caudal broadly edged with white; ventral pale yellow in life; pectorals brown, edged with white; body on sides with about 18 pale olive longitudinal bands, the width of the pupil of the eye, the upper forking posteriorly. Total length $5\frac{15}{16}$ inches. The above description from a specimen from Ikune, in Satsuma.

This species is not rare in the warm waters about the headlands of southern Japan, from Tokyo southward. We have one example obtained by Professor Mitsukuri at Ikune, in Satsuma.

Its distribution to the southward is uncertain, as it has been confused with a closely related species, *Chætodon prætextatus* Cantor (*Tetragonopterus* or *Chætodon collaris* of Bleeker, Günther, and Day), which is probably also *Chætodon reticulatus* of Cuvier and Valenciennes.

In *Chætodon prætextatus*, of which we have specimens from Formosa, the white stripe before the eye extends upward to the forehead, the dark streaks on the sides are more oblique and do not fork at the ends, and the ventrals are darker. Bloch's figure plainly represents *Ch. collaris*, the white stripe before the eye being especially clearly shown. His specimen is said to be from Japan.

The descriptions of *reticulatus* and *prætextatus* do not agree very well with our Formosan specimens. Perhaps we have three or more species of the type, perhaps one varying form. In any case *collaris* is the earliest name.

(*collaris*, having a collar.)

10. CHÆTODON MODESTUS Schlegel.

YAKKODAI (KNAVE TAI[1] OR PERCH).

Chætodon modestus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 80, pl. XLI, fig. 2; Nagasaki.—BLEEKER, Ichth. Fauna Japan, 1853, p. 8; Kaminoseki.—GÜNTHER, Cat. Fish., II, 1860, p. 10; Japan, China.—STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 23; Enoshima.—NYSTROM, Kong. Vet. Ak. Handl., 1887, p. 17; Nagasaki.

[1] Knave used in the sense of a petty feudal retainer.

Chætodon ocellatus GRONOW, Cat. Fish., Ed. Gray, 1854, p. 68; Indian seas (not of Bloch).

Head 3; depth $1\frac{2}{3}$; D. XII, 25; A. III, 21; P. I, 15; V. I, 5; scales about 4–46–14. Body short, deep, and strongly compressed; scales large on the sides, small on the head, soft dorsal and anal and base of the caudal. Head small, the profile above oblique, and the snout produced and pointed; eye a little greater than the snout and $2\frac{2}{3}$ in the head; mouth small, the maxillary to the anterior nostril; nostrils small and close together, the first one-third the eye from its anterior margin; teeth curved and projecting in brush-like bands in each jaw; interorbital space convex; gill-opening long, the membrane a narrow free fold across the isthmus; dorsal spines about equal from the third, the first and second shorter and anteriorly more robust, stronger; soft dorsal with anterior rays longest and with an obtuse angle; anal spines robust, the second the longest; soft anal deep and rounded; pectoral shorter than the head; ventrals with the first ray long and pointed, extending to the base of the first anal spine; caudal truncate, with sharp edges. Lateral line high and concurrent with the margin of the dorsal fin, then descending on the base of the caudal peduncle to the base of the caudal. Caudal peduncle about equal to the eye.

Color in alcohol plain brown, darker above; sides with series of longitudinal dark lines not forking posteriorly; a blackish brown bar through the eye and equal in width to its diameter, margined behind with lighter; a blackish bar along the marginal portion of the soft dorsal and anal; a black ocellus on the upper part of the soft dorsal; a blackish bar at the base of the caudal; a brown bar across the base of the caudal peduncle; ventrals blackish brown; caudal and pectorals pale; tip of the snout blackish. Length $2\frac{5}{16}$ inches.

In smaller specimens there is a broad brownish vertical band on the anterior part of the back, separated by the white area behind the dark ocular bar; the light bar extends from before the dorsal vertically over the opercles to the breast; the dorsal ocellus is broadly bordered with white, extending downward in front of the band on the caudal peduncle as an indistinct light band; the posterior half of the caudal peduncle white; the profile is nearly straight from the tip of the snout to the origin of the dorsal.

In very young specimens the blackish brown band on the caudal peduncle extends along the base of the anal fin, and the bar at the base of the caudal disappears; the snout is convex, and the nuchal scales are large. Here described from a series of specimens from Misaki.

This species is not rare in rocky places along the southern coasts of Japan, and probably the corresponding parts of China. We have eight young examples from the rock pools about Misaki.

(*modestus*, modest.)

11. CHÆTODON NIPPON Döderlein.

SHIRAKODAI (SMALL WHITE PERCH).

Chaetodon nippon DÖDERLEIN, Fische Japans, II, 1883, p. 23, pl. IV, fig 2; Tokyo.

Head $3\frac{1}{3}$; depth $1\frac{2}{3}$; D. XIII, 20; A. III, 17; P. I, 14; V. I, 5; scales about 4-49-20. Body short, deep, strongly compressed; scales moderately large on the sides, small and numerous on the head, soft dorsal and anal, and the base of the caudal. Head small, the profile oblique and nearly straight above; the snout not much produced and pointed; eye greater than the snout, smaller than the interorbital space, and a trifle over 3 in the head; mouth small, the maxillary not reaching the anterior nostril; nostrils small, close together, and some little distance in advance of the eye; teeth curved and projecting in brush-like bands in each jaw; interorbital space convex; gill-opening long, the membrane obsolete; gill rakers short, weak, and not numerous; first and second dorsal spines short and the others about equal, the anterior ones more robust; highest rays of soft dorsal before the middle, and the marginal angle very obtuse; first and second anal spines robust, the third slender; soft anal high in the middle, and the margin of the fin rounded; pectoral low, not as far posteriorly as the ventrals and equal to the head without the snout; ventral spine long, the tip of the fin falling short of the anus by the length of the snout; caudal with the upper rays the longest and the edge obliquely straight. Lateral line high, concurrent with the margin of the dorsal fin, then descending on the base of the caudal peduncle to the base of the caudal. Caudal peduncle compressed, 3 in the head.

Color in alcohol dark brown, the spinous dorsal behind, the soft dorsal and the soft anal very dark brown, the two latter being edged narrowly with white; head dark above, the lips blackish; caudal whitish with its terminal portion broadly grayish. On the sides are traces of many indistinct, longitudinal bands. Length $5\frac{11}{16}$ inches. Here described from Misaki specimens.

This species, the most northern of its genus, has been found only about the peninsulas of Izu and Sagami. We have five specimens, one dredged by the U. S. Fish Commission steamer *Albatross* in Totomi Bay, near Hamamatsu from the rocks at Misaki, the others from the Tokio market, doubtless from Awa or Misaki.

(*Nippon*, or Nip-hon, the general name of the Japanese Empire, wrongly applied on European maps to the chief island, Hondo or Honshyu.)

12. CHÆTODON DÆDALMA Jordan and Fowler, new species.

Head $3\frac{1}{2}$ to $3\frac{3}{4}$; depth $1\frac{3}{5}$ to $1\frac{2}{3}$; D. XII or XIII, 22; A. III, 16; P. I, 14; V. I, 5; scales 6-46-18. Body very deep, short and strongly compressed; scales small, except on the sides, a little in front where they are much enlarged, and on the head, soft dorsal and anal, and caudal becoming very small. Head small, the profile above obliquely vertical, and the snout produced; eye smaller than the snout, $3\frac{1}{2}$ in head and equal to the interorbital space; mouth small, the maxillary reaching to the anterior nostril; nostrils close together and a little

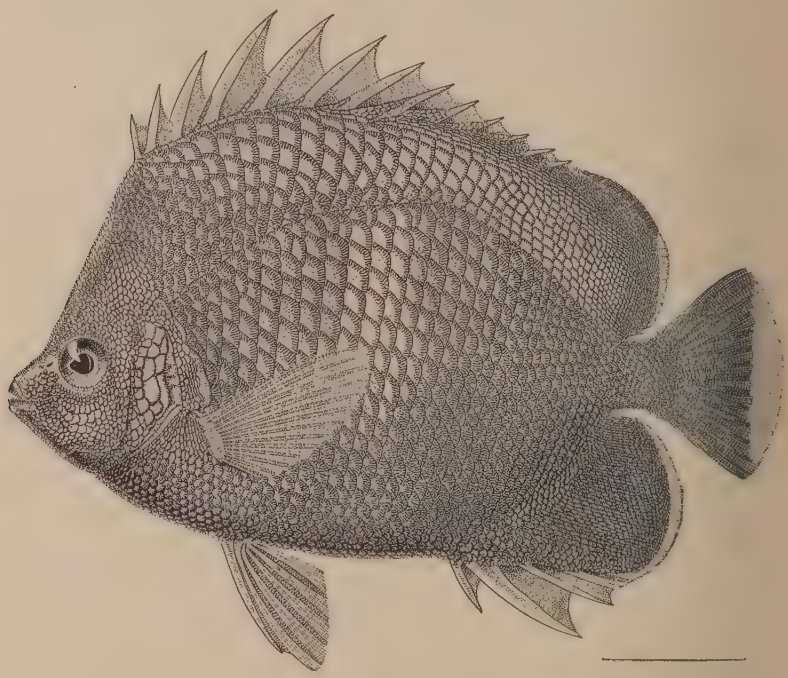

FIG. 4.—CHÆTODON DÆDALMA.

before the eye; teeth curved and projecting in brush-like bands in each jaw; interorbital space convex; gill-opening long, the membrane a narrow fold across and not united to the isthmus; gill rakers short and few; first dorsal spine short, the anterior ones longer than the others and more robust; soft dorsal with the rays in front the longest and the edge rounded; anal spines strong, the first the shortest and the second the longest; soft anal high and the edge rounded; pectoral low and about equal to the head; ventrals about equal to the pectorals, but not reaching the anus; caudal squarely truncate, the edge straight. Lateral line high, arched, concurrent with dorsal fin, and

indistinct on the caudal peduncle. Caudal peduncle compressed and $2\frac{1}{2}$ in head.

Color in alcohol deep blackish brown, the scales everywhere with their centers pale yellow and their edges broadly margined with blackish brown, forming a beautiful reticulated or netted pattern; edges of soft dorsal, anal, and caudal broadly margined with yellow; pectoral blackish with a large yellow spot on its middle; ventrals and space in front and between their bases deep blackish brown; along the sides longitudinal dark bands are formed, due to the course of the scales. Total length $6\frac{3}{4}$ inches. Here described from Okinawa specimens.

Type. No. 7190, Leland Stanford Junior University Museum. Cotypes are in the U. S. National Museum.

We have received three specimens of this handsome species from Nafa, in Okinawa, two of them collected by Yonekichi Koneyama, the other from the Imperial University.

(*δαιδαλμα*, a piece of art embroidery.)

7. CORADION Kaup.

Coradion KAUP, Wiegmann's Archiv, XXIV, 1860, pl. I, p. 146 (*chrysozonus*).

This genus is allied to *Chætodon*, differing in its angular form, the base of most of the soft dorsal and anal being nearly vertical, in the very small teeth, and in the small number (8 to 11) of the dorsal spines, which are very strong; anal spines 3, very strong; scales moderate. Species few, of the East Indies.

(*κοράδιον*, *κορίδιον*, a little girl.)

13. CORADION DESMOTES Jordan and Fowler, new species.

Head $2\frac{3}{4}$; depth $1\frac{1}{3}$; D. II, 22; A. III, 18; P. I, 14; V. I, 5; scales 4–52?–30. Body very short, deep, and compressed; scales small, except on the sides a little in front, where they are enlarged, and becoming very small on the head, soft dorsal, anal, and caudal. Head moderate, the profile above very concave and ascending steeply to the dorsal; eye equal to the snout (?) a trifle over 3 in the snout (?) and greater than the interorbital space; snout produced and pointed; mouth small, the maxillary reaching to below the anterior nostril; nostrils close together and a little before the eye; teeth projecting in brush-like bands in the jaws; interorbital space convex; gill-opening long, the membrane a narrow fold across the isthmus; gill rakers short, weak, and not especially numerous; spines anterior to the third dorsal spine short, the latter and the 3 or 4 succeeding, robust and longer than the others, so that the fin is high in front; the anterior 7 soft dorsal rays long, after which the others diminish so that a blunt angle is formed along the margin; anal spine strong, the first the shortest; soft anal deep in the front and middle, with its edge rounded; pectoral low, shorter than the head; ventrals longer than the pectorals, reaching beyond the origin of the anal; caudal square, the edge nearly

straight. Lateral line high, nearly concurrent with the margin of the dorsal, and forming a blunt angle a little posteriorly concurrent with that of the soft dorsal. Only a few pores on the caudal peduncle, which is compressed and equal to the first anal spine.

Color in alcohol pale brown, with a broad vertical band from the origin of the spinous dorsal through eye, about equal to it in width; a narrow band from the supraoccipital region to the tip of the snout; a broad brown band, a little less in width than the length of the pectoral,

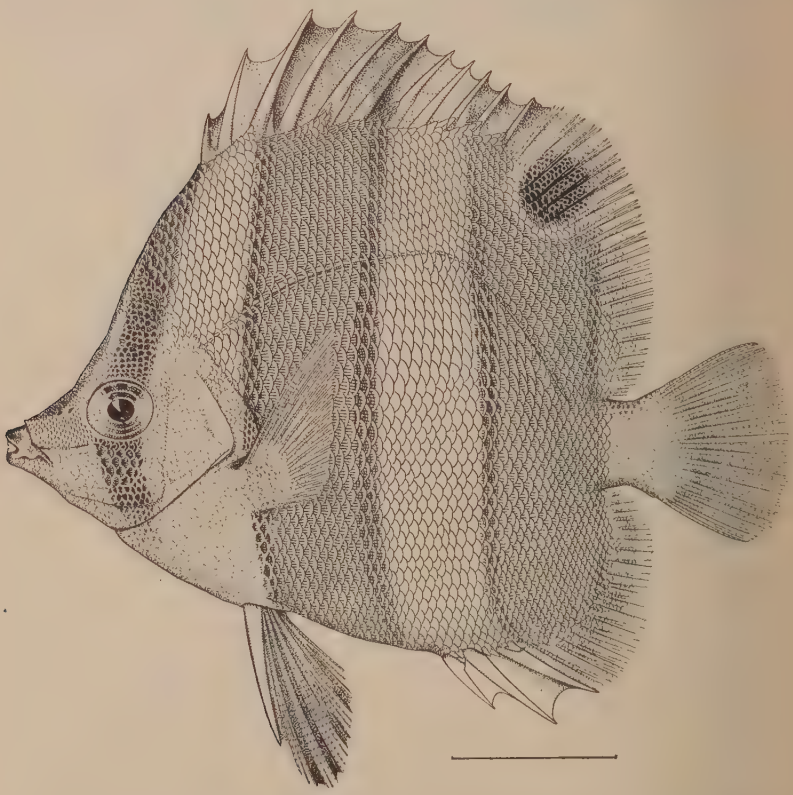

FIG. 5.—CORADION DESMOTES.

and margined narrowly with darker, from the spinous dorsal above to the belly, and a similar band of about equal width from soft dorsal to the soft anal; anterior part of soft dorsal with a black ocellus, the edge white, equal to the eye; caudal with the base brown and the outer half gray; ventrals blackish; a light band over caudal peduncle behind and the anterior part of the base of the caudal. Length, $4\frac{11}{16}$ inches. Described from a single fine specimen taken at Nagasaki.

Type.—No. 7192, Leland Stanford Junior University Museum.

(δεσμώτης, a prisoner, alluding to the narrow cross-bars.)

8. MICROCANTHUS Swainson.

Microcanthus SWAINSON, Class. Anim., II, 1839, p. 215 (*strigatus*).

This genus differs from *Chætodon* chiefly in the small scales, there being about 60 in the lateral line. The soft dorsal and anal are shorter than is usual in *Chætodon*, the fin formula of the typical species being D. XI, 17; A. III, 14. It is in fact doubtful whether the genus contains a second species, as the other species with small scales have the soft fins many-rayed and constitute Bleeker's genus *Hemitaurichthys* (type, *polylepis*), which is apparently a valid genus. In any case it has no close relation to *Microcanthus strigatus*.

(μικρός, small; ἄκανθα, spine.)

14. MICROCANTHUS STRIGATUS (Cuvier and Valenciennes).

KAGOKAKIDAI (CHAIR CARRIER PERCH); SHIMAYAKKODAI (STRIPED KNAVE PERCH.)

Chætodon strigatus (Langsdorf) CUVIER and VALENCIENNES, Hist. Poiss., II, 1831, p. 25, pl. CXX; Japan.—SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 80, pl. XLI, fig. 1; Nagasaki.—BLEEKER, Verh. Bat. Gen., XXVI, 1857, Japan, p. 94; Nagasaki.—GÜNTHER, Cat. Fish., II, 1860, p. 34; China, Japan.—STEINDACHNER and DÖDERLEIN, Fische Japans, II, 1883, p. 23; Tokyo.—NYSTROM, Kong. Vet. Ak. Handl., 1887, p. 18; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 52; Tokyo, Kagoshima.—STEINDACHNER, Reise Aurora, 1896, p. 202; Kobe.

Hemitaurichthys strigatus JORDAN and SNYDER, Check List, 1901, p. 90.

Head 3; depth 2; D. XI, 16; A. III, 16; P. I, 15; V. I, 5; scales 9–62–24. Body a little long, deep and compressed; scales more or less uniform on the trunk, small on the head and becoming very small on the soft dorsal, anal, and the base of the caudal. Head moderately compressed, the profile steeply convex above the eye; eye $2\frac{3}{4}$ in the head and greater than the interorbital space; snout nearly straight above, pointed and projecting; mouth moderately large, the maxillary extending to the anterior margin of the eye; nostrils small, directly in front of, and near the anterior margin of the eye; teeth in a brush-like series in the jaws; interorbital space flatly convex; gill-opening large, the membrane free from the isthmus; gill rakers rather short and in moderate number; dorsal spines strong, longest anteriorly, and graduated to the last, the first and second short; soft dorsal long in front, its margin rounded; second anal spine very large and strong; soft anal high in front and then decreasing to the last ray, the margin of the fin nearly straight; pectoral rather short, $1\frac{2}{3}$ in head; ventrals long and pointed, longer than the pectorals and reaching the origin of the anal; caudal with the lobes not produced much, pointed, and the margin concave. Lateral line arched, concurrent with the margin of the scaly sheath about the base of the spinous dorsal and the margin of the soft dorsal, and then running straight along the caudal peduncle to the base of the caudal. Caudal peduncle compressed and about equal to the ventral spines.

Color in alcohol pale, with 7 longitudinal slightly inclined broad blackish brown bands, the first along the middle of the spinous dorsal backward from the upper part of the third ray, then the others following below in a parallel manner; on the supraoccipital region of the head two bands running down between the eyes and uniting near the end of the snout; a dark bar from snout to eye; a dark spot on base of the pectoral; ventrals and caudal plain. Length 7⅞ inches. In very small specimens the dark bars are very distinctly defined; there are 2 black spots on the dorsal, one at the base of the anterior spine and the other at the base of the anterior rays; on the anal the pectoral bar is continued out over the base of the anal spines on to the anterior rays, and there is also a black spot at the base of the posterior rays; a black band originates on the head above the eyes and forks at the pectoral, the anterior division going to the ventrals; a dark stripe runs across the chin from the maxillaries; outer portions of ventrals black. Here described from examples from Wakanoura.

This species is rather common about the headlands of southern Japan. Our numerous specimens are from Tokyo, Misaki, and Nagasaki. It is easily recognized by its 5 or 6 lengthwise stripes. It lacks altogether the ocular cross-band almost universal in *Chætodon*.

(*strigatus*, striped.)

9. HENIOCHUS Cuvier and Valenciennes.

Heniochus Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 92 (*macrolepidotus*).

Taurichthys Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 146 (*varius*).

Diphreutes Cantor, Malayan Fishes, 1850, p. 159 (*macrolepidotus*; substitute for *Heniochus*, on account of *Henioche*, a prior genus of *Lepidoptera*).

Body much compressed and elevated; the forehead in the adult often with bony projections; dorsal spines 11 to 13, the fourth greatly elevated and filiform; muzzle rather short; no teeth on the palate; no spine on the preopercle; scales moderate. East Indies; allied to *Chætodon*, but well distinguished by the prolongation of the fourth dorsal spine.

(ἡνίοχος, a coachman, from the whip-like dorsal spine.)

15. HENIOCHUS MACROLEPIDOTUS (Linnæus).

HATATATEDAI (FLAG RAISER PERCH).

Chætodon macrolepidotus Linnæus, Syst. Nat., 10th ed., 1758, p. 274 (after Artedi, Chætodon lineis utruique 2-nigris radio quarto dorsali longissimo setiformi).—Bloch, Ichth., 1788, p. 50, pl. cc, fig. 1; India.

Heniochus macrolepidotus Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 93.—Schlegel, Fauna Japonica, Poiss., 1847, p. 82, pl. xliv, fig. 1; Nagasaki.—Richardson, Ichth. China, 1846, p. 246; Canton.—Günther, Cat. Fish., II, 1860, p. 39; Ceylon, Amboyna, Port Essington.—Day, Fish India, 1875, p. 110, pl. viii, fig. 3.—Steindachner and Döderlein, Fische Japans, II, 1883, p. 24; Kochi.

Taurichthys macrolepidotus, Bleeker, Atlas Ichth., Chæt., 1877–78, p. 29, pl. v, fig. 1; Sumatra, Pinang, Celebes, Singapore, Java, Sumbawa, Luzon, New Guinea, etc.

Chætodon bifasciatus Shaw, Genl. Zool., IV, 1803, p. 342.

Heniochus acuminatus Cuvier and Valenciennes, Hist. Poiss., VII, 1831, p. 98.

Chætodon mycteryzans Gronow, Cat. Fish., Ed. Gray, 1854, p. 76.

Head 3; depth $1\frac{3}{5}$; D. XII, 23; A. III, 17; P. I, 16; V. I, 5; scales about 4-44-24. Body deep, compressed, the scales enlarged on the sides, small on the head, and becoming very small on the basal portion of the soft dorsal, anal, and the caudal. Head rather deep; eye $2\frac{3}{4}$ in the head and much larger than the interorbital space; snout nearly straight above, shorter than the eye, pointed and projecting; mouth rather small, the maxillary reaching nearly to the anterior nostril; nostrils close together in front of the eye; teeth small and fine in both jaws; interorbital space convex; gill-opening large, the rakers small and not numerous; gill-membrane very narrow and free from the isthmus; dorsal high in front, graduated to the fourth spine, which is very long, attenuated, and furnished with a filament, the total length exceeding the entire length of the fish; the fifth spine is longer than the third; middle of soft dorsal elevated; first anal spine short; soft anal with the anterior rays elevated into a sharp angle, then rapidly decreasing to the last, which are very short; pectoral low, moderate, about equal to the ventral spine; ventral under the pectoral very long, reaching to the middle of the base of the anal, and the tip of the ventral spine not extending to the origin of the anal; caudal moderate, the edge somewhat rounded. Lateral line high, very much arched, and extending down on the caudal peduncle. Caudal peduncle compressed, and equal to the eye.

Color in alcohol, dark above, head silvery white; the snout dark brownish and a dark brown band from one eye to the other across the forehead; a dark brown band from the first dorsal spines down the sides including the posterior part of the gill-opening, and the base of the pectoral to the belly, where it becomes broader and joining the one from the opposite side of the body; a white band of similar width behind the one just described, becoming very broad below, so that it extends over the first half of the anal fin; there is a second broad black band arising behind the tip of the fifth dorsal spine and extending obliquely across the body so as to include the posterior half of the anal fin; behind this the rest of the body is pale and silvery; the dark bands where they extend on the dorsal and anal fins, together with the entire ventral fins, are black. Length, $2\frac{3}{4}$ inches. In a very young specimen the profile of the body above and in front is more obliquely inclined, and the brown bands are broader, the posterior occupying all the rest of the back and caudal peduncle; the large nuchal scales are well developed. Here described from Wakanoura examples.

The young of this species are frequently taken in the Kuro Shiwo off the headlands in southern Japan. No adult examples have yet been recorded, and it is probable that the species does not breed in Japan. It is a handsome fish and may be known at all ages by the produced dorsal spine.

Our examples differ from the figures of Bleeker and Day in showing no black markings on the anterior part of the anal fin. Probably this coloration changes with age. If not, two distinct species may be confounded under the name of *Heniochus macrolepidotus*. Our numerous specimens, the longest less than 3 inches, are from Wakanoura and Nagasaki.

(μακρολεπιδοτός, large-scaled.)

10. HOLACANTHUS Lacépède.

Holacanthus LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 525 (*tricolor;* scales large; caudal forked).

Genicanthus SWAINSON, Class. Fishes, II, 1839, p. 212 (*lamarckii;* scales large; caudal forked).

Centropyge KAUP, Wiegmann's Archiv., XXVI, 1876, p. 138 (*tibicen;* erroneously said to have four anal spines).

Chætodontoplus BLEEKER, Archiv. Neerl. Sci. Nat., XII, 1876, p. 26 (*mesoleucus;* isthmus broad).

Acanthochætodon BLEEKER, Archiv. Neerl. Sci. Nat., XII, 1876, p. 5 (*lepidolepis;* isthmus narrow; body elevated).

?*Angelichthys* JORDAN and EVERMANN, Check List, Fishes, 1896, p. 420 (*ciliaris*).

Body oblong or elevated, rather robust; scales rather small, roughish, often mixed with smaller ones. Vertical limb of preopercle with serræ, large or small; a strong spine at the angle of the preopercle, this usually grooved; interopercle short, armed with strong spines; dorsal spine with 12 to 15 strong spines, which are usually graduated, increasing in height to the last; soft dorsal moderate, with 17 to 20 rays, usually not ending in streamers. Coloration usually brilliant and well defined. Species numerous in all tropical seas, abounding about coral reefs. We include provisionally under *Holacanthus* the subgenera *Angelichthys*, *Chætodontoplus*, and *Acanthochætodon*. The following is an analysis of their principal characters:

a. Ascending limb of preopercle with fine serrations only.
  b. Caudal rounded.
    c. Gill-membranes very broadly joined to the isthmus; body oblong-ovate; scales small ..... *Chætodontoplus.*
    cc. Gill-membrane narrowly joined to the isthmus.
      d. Body oblong, not elevated; scales rather large ..... *Centropyge.*
      dd. Body more or less elevated; scales small ..... *Acanthochætodon.*
  bb. Caudal lunate, with produced lobes, scales large ..... *Holacanthus.*
aa. Ascending limb of preopercle with strong spines ..... *Angelichthys.*

The three Japanese species belong to *Acanthochætodon* and *Centropyge.*

(ὅλος, whole; ἄκανθα, spine.)

a. ACANTHOCHÆTODON; scales very small; gill-membranes narrowly joined to the isthmus; caudal rounded; body deep.

b. Body golden brown, with numerous blue or blackish stripes.

c. Stripes on body relatively narrow, bright blue with darker edges, these extending horizontally on the soft dorsal fin ..... *septentrionalis*, 16.

cc. Stripes on body broader, blackish, these extending on the soft dorsal fin in the direction of the rays ..... *ronin*, 17.

aa. CENTROPYGE; scales large; isthmus narrow; body oblong; caudal rounded.

d. Body blackish with an ovate white spot or crossband; scales rather large, rough ..... *tibicen*, 18.

16. HOLACANTHUS SEPTENTRIONALIS Schlegel.

KINJAKUUO (PURSE FISH).

Holacanthus septentrionalis SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 82, pl. XLIV; Nagasaki.—GÜNTHER, Cat. Fish., II, 1860, p. 52.—STEINDACHNER and DÖDERLEIN, Fische Japans, II, 1883, p. 24; Tokyo.—ISHIKAWA, Prel. Cat., 1897, p. 52; Tokyo.

Head $3\frac{2}{3}$; depth $1\frac{2}{3}$; D. I–XIII, 18; A. III, 19; P. I, 17; V. I, 5. Body deep, strongly compressed, and covered almost everywhere with small rough scales. Head deep, the profile steep above; snout not produced, and blunt; eye small, high, $1\frac{2}{5}$ in the snout, $3\frac{2}{3}$ in the head, and $1\frac{2}{5}$ in the interorbital space; profile of body from snout to ventrals evenly convex; mouth rather small, the maxillary nearly vertical and not extending to the posterior nostril; nostrils small, close together, and in front of the eye; lower jaw projecting a little; teeth slender, numerous, and in brush-like series in either jaw; interorbital space strongly convex; preopercle with finely denticulate edge, and armed with a strong, compressed spine, directed backward. Gill-opening large, the isthmus thick, and the membrane narrowly joined to it; gill rakers short and in moderate number. Dorsal and anal almost entirely covered with small rough scales, the spinous portions of the fins very rough; spinous dorsal highest posteriorly, gradually sloping up from the front; soft dorsal high in the front and with its margin rounded; anal graduated to the third spine, which is the longest, and the edge of the soft fin rounded behind; pectorals short, rounded, shorter than the ventrals and $1\frac{2}{5}$ in the head; ventrals with a strong roughened spine, not reaching the anus, and the tip of the longest ray not reaching the origin of the anal. Lateral line arched above so that it is concurrent with the margin of the dorsal and running on the caudal peduncle. Caudal peduncle compressed, and a little over 2 in the head.

Color in alcohol dark brown, the caudal white, very narrowly margined with brown; soft dorsal and anal a little darker than the body color, their margins very narrowly white, and then with very narrow blackish marginal stripes; on the sides are 7 or 8 narrow longitudinal bluish stripes margined with black, and on the dorsal and anal are several similar irregular narrow longitudinal stripes running the length

of the fins; pectorals with a bar across its basal portion, otherwise like the ventrals, plain. Length $6\frac{7}{16}$ inches. Here described from a specimen from Ikune, from Satsuma, in Kiusiu.

This handsome fish is rarely taken off the headlands of southern Japan. We have one fine specimen from Ikune in Satsuma, a province in the island of Kiusiu.

(*septentrionalis*, northern, most species of the genus being exclusively tropical.)

17. HOLACANTHUS RONIN Jordan and Fowler, new species.

Head $3\frac{1}{2}$; depth $1\frac{2}{3}$ to $1\frac{5}{6}$; D. I–XIII, 18 or 19; A. III, 17; P. I, 17; V. I, 5. Body deep, strongly compressed, and covered almost

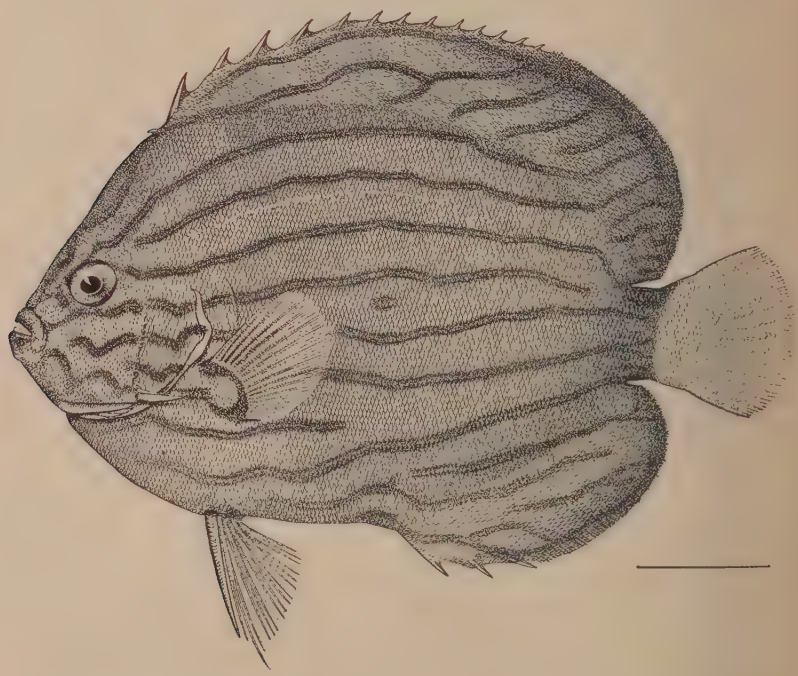

FIG. 6.—HOLACANTHUS RONIN.

everywhere with small, rough scales. Head deep; the profile above, very steep, and convex in the young, becoming more oblique and straight with age; eye small, high, $2\frac{1}{2}$ to 4 in the head, and 1 to $1\frac{2}{5}$ in the interorbital space; the eye a third longer than the snout in the young and $1\frac{2}{5}$ in the same in the adult; profile of body, convex from the tip of the snout to the ventrals; mouth small, the maxillary nearly vertical, and not extending beyond anterior nostril; nostrils small, close together, and in front of the eye; the lower

jaw projects, the snout being blunt; teeth slender, numerous, and in brush-like series in the jaws; preoperculum, with the edge finely denticulate, and armed below with a strong, compressed spine, directed backward; gill-opening large, the isthmus thick, and the membrane narrowly joined to it; gill rakers short and in moderate number; dorsal and anal almost entirely covered with small, rough scales, the spinous portions of the fins very rough; spinous dorsal higher posteriorly, gradually sloping up from the front; soft dorsal high, its edge rounded; anal graduated to the third spine which is the longest; soft anal high, the edge rounded behind; pectorals, low; ventral spine equal to third anal spine. Lateral line arched above, so that it is concurrent with the margin of the dorsal, and extending on the caudal peduncle. Caudal peduncle compressed, and a trifle over 2 in the head.

Color of the adult in spirits, dark brown, the caudal white; soft dorsal, anal, and caudal peduncle blackish, the edges of the former two fins narrowly margined with white; on the sides are 10 narrow longitudinal dark bands, margined rather broadly with blackish, some extending out on the soft dorsal and anal nearly parallel with the fin rays; on the anterior part of the dorsal and anal, several of the bars are nearly longitudinal; pectoral with a bar across its basal portion, otherwise, like the ventrals, plain. Length, $5\frac{1}{16}$ inches. In a small specimen, $2\frac{15}{16}$ inches long, the bands on the sides are 7 in number and broad, the soft dorsal and anal are very dark, almost uniform black, and there are two broad longitudinal bands on the spinous dorsal extending to the soft dorsal and two similar bands on the anal in front. In both specimens the bands are sometimes either interrupted or broken, the two sides not conforming. Here described from two examples, the larger from Misaki and the smaller from Wakanoura.

Numbered 7191, Leland Stanford Junior University Museum.

The specimen from Misaki was obtained from the Asakusa Aquarium in Tokio through the courtesy of Dr. Kishinouye.

The species is extremely close to *Holacanthus septentrionalis*, but differs in the color and direction of its dark stripes.

(*ronin*, a Japanese feudal waif, a retainer whose feudal lord is dead or degraded; an allusion to the habitat of the species distant from the Tropics, the original home of *Holacanthus*.)

18. HOLACANTHUS TIBICEN Cuvier and Valenciennes.

Holacanthus tibicen CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 1831, p. 173 (locality unknown; specimen in the Leyden Museum).—GÜNTHER, Cat. Fish., II, 1861, p. 46 (copied).—BLEEKER, Atlas Ichth. Chæt., 1877–78, pl. VIII, fig. 4; Celebes, Flores, Ternate, Amboina, Ceram, Solor.

Holacanthus leucopleura BLEEKER, Solor, 1853, p. 79; Solor.—GÜNTHER, Cat. Fish., II, 1861, p. 46; Amboina.

Head $3\frac{2}{3}$; depth $1\frac{5}{6}$; D. XIV, 16; A. III, 17; P. I, 15; V. I, 5; scales 4–32–21. Body oblong, deep and compressed, and covered with striated, ctenoid scales. Head deep, the profile above very steep and convex; snout blunt and not produced; eye 3 in the head, greater than the snout and equal to the interorbital space; nostrils small, close together and directly in front of the eye; teeth slender, fine and in brush-like series in each jaw; profile of body convex below from tip of snout to the ventrals; mouth small, the teeth produced, and the maxillary below the posterior nostril; preorbital with several small denticles along its lower edge; preoperculum with its edge denticulate and produced below into a sharp spine directed backward, and equal to two-thirds the length of the ventral spine; lower margin of the gill-opening above the preoperculur spine, denticulate; interorbital space strongly convex; gill-opening large, the membrane narrowly joined to the isthmus; gill rakers short and not numerous; spinous dorsal highest behind; soft dorsal higher behind the middle, with the angle rounded; soft anal highest behind and with a rounded angle; pectoral equal to ventral, the latter not reaching the anal; caudal convexly rounded. Lateral line high, arched and nearly concurrent with the dorsal outline. Caudal peduncle compressed, $1\frac{2}{3}$ in the pectoral.

Color in alcohol blackish brown, except a large, white, vertical, oblong blotch on the sides above and behind the shoulders, and the lower margin of the spinous and soft anal, which are also white. Total length $4\frac{5}{16}$ inches. Here described from an example from Okinawa.

This rare species is known to us from a fine specimen obtained at Nafa, Riukiu Islands, by Yonekichi Koneyama. It is well figured by Bleeker.

(*tibicen*, a flute-player, the allusion not explained.)

Family V. ZANCLIDÆ.

MOORISH IDOLS.

Body oblong, much compressed and elevated, covered with minute rough scales. Mouth small, with long, slender, brush-like teeth; no teeth on the palate; bones of top of head thick and solid, developing with age a conspicuous median horn on the forehead, wanting in the young. Preopercle unarmed. Dorsal single, with 7 spines, the third and succeeding spines prolonged into long filaments; interspinal bone projecting before dorsal. Anal similar to soft dorsal, long, with its anterior rays produced; a small antrorse spine before anal. Caudal peduncle unarmed, the fin lunate; pectorals short; ventrals pointed. Intestine long. Coracoid bones largely developed. Vertebræ reduced in number, 9+13=22. Air bladder large. Branchiostegals 4; pyloric cæca 14. One species, widely distributed about rocky islands of the Pacific.

11. ZANCLUS Cuvier and Valenciennes.

Zanclus (Commerson Ms.) LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 473 (*cornutus;* non-binomial).

Pomacanthus pt. LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 517 (*canescens*, etc.).

Zanclus CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 1831, p. 102 (*cornutus*).

Gonopterus GRONOW, Cat. Fish., Ed. Gray, 1854, p. 77 (*mœrens*).

Gnathocentrum GUICHENOT, Ann. Maine et Loire, IX, 1866, p. 4 (*centrognathum;* young).

Characters of the genus included above. It is possible that the generic name *Pomacanthus*, Lacépède, should be used for this genus, as the first species placed in that composite group by its author is the *Chætodon canescens* of Linnæus. The name *Zanclus* occurs still earlier in Lacépède's work, but not in binomial form. It is, however, for reason of priority adopted by Bleeker. If, however, the first species named be recognized as the type of the genus, a rule the present writers believe to be finally inevitable, we must substitute *Pomacanthus* for *Zanclus*.

(ζάγκλον, a sickle.)

19. ZANCLUS CANESCENS (Linnæus).

Chætodon canescens LINNÆUS, Syst. Nat., 10th ed., 1758, p. 272; Indies (after Artedi; young).

Pomacanthus canescens LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 517.

Zanclus canescens GÜNTHER, Cat., II, 1860, p. 493.—BLEEKER, Atlas Ichth., Chæt., 1877–78, p. 78, pl. v, fig. 3; Celebes, Amboina.

Chætodon cornutus LINNÆUS, Syst. Nat., 10th ed., 1758, p. 273 (after Artedi; adult).—LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 473, pl. II, fig. 1.—JORDAN and EVERMANN, Fish N. and M. America, II, 1898, p. 1687.

Zanclus cornutus CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 1831, p. 102, pl. CLXXVII.—BLEEKER, Atlas Ichth., Chæt., 1877–78, p. 77, pl. IV, figs. 1, 2; Sumatra, Java, Celebes, Ceram, New Guinea, Waigiu, etc.

Zanclus centrognathus CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 1831, p. 528; near equator, 75° E.

Gonopterus mœrens GRONOW, Cat. Fish., Ed. Gray, 1854, p. 77; India.

Chætodon nudus GRONOW, Cat. Fish., Ed. Gray, 1854, p. 76; Mari Indico.

Zanclus montrouzieri THIOLLIÈRE, in Montrousier, Fauna Woodlark Island, 1857, p. 168; Woodlark.

Head $2\frac{3}{5}$; depth about as great as length; eye $2\frac{1}{2}$ in snout. D. IX, 38; A. III, 33; snout $1\frac{1}{2}$ in head, greatly produced, the upper profile very concave; teeth slender, brush-like, very much projecting; anterior rays of dorsal and anal produced; first and second dorsal spines very short, the third greatly produced, ending in a long filament exceeding total length of fish; the longest soft ray about $1\frac{1}{3}$ in body; posterior dorsal rays short, vertical, or even inclined forward; pectoral some longer than snout, shorter than the ventrals.

Color in life, snout chiefly white, point of upper jaw black, followed by a large orange patch separated from the white by a narrow black

band; lower jaw mostly black; anterior part of body from first dorsal spine to ventrals black, this crossed by two narrow vertical blue lines, the first beginning at origin of ventrals, extending upward and forward, then backward just behind orbit, and ending on median line of back in front of dorsal fin; the second beginning on abdomen, crosses body at base of pectoral and ends at origin of dorsal fin; a third less distinct one extends upward and backward from eye; a broad whitish bar, nearly as broad as length of head, begins on anterior part of dorsal fin and crosses body somewhat obliquely backward, covering anterior portion of anal fin; posteriorly this bar is washed with yellow or orange, which gradually fades into the white of the anterior part; next comes a black bar one-half as wide, covering the bases of about 14 dorsal rays and widening out upon the anal so as to cover the greater part of about 24 rays; in the posterior part of this black band is a narrow white line; next a yellow or orange band covering all of the caudal peduncle and the posterior portions of the dorsal and anal fins; caudal fin black, a narrow white line at base; tip of caudal fin with a crescent-shaped border of white more or less washed with yellowish; pectorals pale; ventrals black. East Indies and islands of Polynesia; common and widely distributed; ranging east to the Hawaiian Islands and the offshore islands of Mexico, the young carried northward in the Kuro Shiwo to the coasts of Japan, where it is not rare in the rock pools of the headlands. Here described from a specimen from Misaki, $3\frac{13}{16}$ inches long.

Bleeker recognizes two species of this genus, the common form, *Zanclus cornutus*, with a preorbital spine in the adult, and a smaller one, *Zanclus canescens*, deeper in the body with a spine before the eye. All that we have seen are referable to *Zanclus cornutus*, but the other shows no tangible difference. *Canescens* is the older name.

(*canescens*, growing gray.)

Family VI. ACANTHURIDÆ.

SURGEON-FISHES.

Body oblong, compressed and usually elevated, covered with very small scales; lateral line continuous. Tail armed with one or more spines or bony plates. Eye lateral, high up; preorbital very narrow and deep. Nostrils double. Mouth small, low; each jaw with a single series of narrow incisor-like teeth; vomer and palatines toothless; premaxillaries somewhat movable but not protractile; maxillary short, closely united with the premaxillary; gill rakers obsolete; pseudobranchiæ large; gills 4, a slit behind the fourth; gill-membranes attached to the isthmus, the openings thus restricted to the sides. A single dorsal fin, with strong spines, the spinous part of the fin shorter than the soft part; anal fin similar to soft dorsal; pectorals moder-

ate; ventral fins present, thoracic, I, 5. Pelvis bones long, narrow, curved, closely connected, evident through the skin, as in *Balistidæ*. Pyloric cæca rather few; air bladder large; intestinal canal long. Vertebræ 9 + 13 = 22. Posterior suborbital bones in close contact with the preopercle; post-temporal immovably united with the skull, apparently simple, but really trifurcate with the interspaces filled in with bone, the foramen not passing through it; interneural bones with transversely expanded buckler-like subcutaneous plates, which intervene between the spines and limit their motion forward; epipleurals developed from the ribs. Herbivorous fishes of the tropical seas. These fishes undergo large changes with age as is the case with the *Chætodontidæ*, the young having often been described as distinct genera.

a. Caudal armature developed as a movable antrorse, extremely sharp, knife-edged spine, erectile from a groove.
  b. Ventral rays I, 5; teeth fixed and strong; anal spines 3.
    c. Dorsal spines about 9 ..... *Teuthis*, 12.
    cc. Dorsal spines 4 or 5; soft dorsal elevated ..... *Zebrasoma*, 13.
aa. Caudal armature developed as immovable tubercles or lamina.
    d. Ventral rays I, 5; anal spines 3; dorsal spines usually 8; caudal plates 3 or 4, broad, rugose, with a central nonserrated spine ..... *Xesurus*, 14.
    dd. Ventral rays I, 3; dorsal spines 4 to 6; anal spines 2; caudal plates 1 or 2, absent in the young; adult usually with a bony frontal prominence. *Acanthurus*, 15.

12. TEUTHIS Linnæus.

Rhombotides Klein, Historia Piscum, 1740 (nonbinomial).
Hepatus Gronow, Zoöphyl., 1765 (*hepatus;* nonbinomial).
Teuthis Linnæus, Syst. Nat., 12th ed., 1766, p. 507 (*hepatus; javus;* after *Hepatus*, Gronow).
Harpurus (Forster) Gmelin, Syst. Nat., I, 1788, p. 1269 (species "cauda utriuque spina vel squama ossea falcata munite").
Aspisurus Lacépède, Hist. Nat. Poiss., IV, 1802, p. 556 (*sohar*).
Theuthis Cuvier, Tab. El. Hist. Nat., 1798, p. 371.
Theutis Cuvier, Règne Animal, 1st ed., II, 1817, p. 330 (restricted to *Les Acanthures;* allies of *Teuthis hepatus*).
Teuthys Swainson, altered orthography.
Acronurus Günther, Cat. Fish., III, 1861, p. 345 (*orbicularis;* young fishes apparently scaleless).
Rhombotides (Klein) Day, Fishes India, I, 1876, p. 202.
Acanthurus, of authors generally, not of Forskål as here understood.

This genus includes those *Acanthuridæ* which have the tail armed with a sharp, antrorse, lancet-like, movable spine; strong, fixed, incisor teeth; ventral rays I, 5, and about 9 spines in the dorsal fin. The numerous species are found in all tropical seas; herbivorous fishes, living about coral reefs; the adult protected by the murderous caudal spine, which grows larger with age.

(τευθίς, the Squid, *Loligo;* substituted by Linnæus for Gronow's name, *Hepatus*, for no evident reason.)

a. Caudal spine small; body light gray, with about six cross bars, narrower than the interspaces; end of caudal peduncle with two black spots; dorsal rays about IX, 23; anal III, 21 ..... *triostegus*, 20.

aa. Caudal spine strong; body dark brown, uniform, or with faint bluish streaks; dorsal rays about IX, 26; anal III, 24.

b. Axil of dorsal and anal fins without black spot; body and fins with faint streaks ..... *argenteus*, 21.

bb. Axil of dorsal and anal fins with a jet black spot; lips black; body and fins almost plain dark brown ..... *bipunctatus*, 22.

20. TEUTHIS TRIOSTEGUS (Linnæus).

SHIMADAI: (STRIPED PERCH.)

Chætodon triostegus LINNÆUS, Syst. Nat., 10th ed., 1758, p. 274; India.

Acanthurus triostegus CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 1835, p. 197.—GÜNTHER, Cat. Fish., III, 1861, p. 327; Amboina, Celebes, Aneitum, Australia, Malayan Archipelago.—ISHIKAWA, Prel. Cat., 1897, p. 34; Ogasahara (Bonin Islands).

Chætodon zebra LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 25, fig. 3; no locality.

Acanthurus zebra LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 546, pl. VI, fig. 3; no locality.

Chætodon couagga LACÉPÈDE, Hist. Nat. Poiss., IV, 1802, p. 727; no locality.

Teuthis australis GRAY, in King's Narr. Survey Coast of Australia, II, 1826, p. 435; west coast of Australia.

Acanthurus hirundo BENNETT, Ceylon Fishes, 1830, p. 11, pl. XI; Ceylon.

Acanthurus subarmatus BENNETT, Whaling Voyage, II, 1840, p. 278; Society Islands.

Harpurus fasciatus FORSTER, Desc. Anim., Ed. Licht., 1844, p. 216.

Head $3\frac{2}{5}$ to 4; depth $1\frac{5}{8}$ to 2; eye $2\frac{1}{2}$ in snout. D. IX or X–22 or 23; A. III–20 to 22. Body ovate, anterior profile gently curved, most convex over eyes; snout somewhat produced, concave above. Dorsal fin moderate, anterior spines more or less concealed in the skin, the longest spines about equal to the snout, the soft rays equal; first anal spine very short, the third longest, about equal to the longest dorsal spines; soft portion of anal about as high as the third anal spine; caudal slightly lunate, the lobes but little produced; pectorals about as long as head; ventrals as long as snout, including the eye. Color in life dark greenish or slaty above with yellowish cloudings; chin, belly, throat, and a narrow strip along base of anal white; vertical fins dusky; anal with a narrow white margin; pectorals plain; ventrals white on under surface; sides with 5 black bars, each wider than the eye, the first, beginning just in front of the branchiostegals, extends upward and backward across cheek through eye and to median line of back, where it meets its fellow from the other side, is narrower than the eye; the second begins at front of dorsal fin and extends downward to base of pectoral, from which point it is continued downward in a narrower line beginning on base of pectoral and ending just above base of ventral; the third begins near base of sixth dorsal spine and extends across side to belly at a point midway between anus and begin-

ning of anal fin; the fourth begins on base of first dorsal ray and extends to first anal ray; the fifth begins at base of seventh dorsal ray and extends across side to base of fifth anal ray; a narrow, faint brown bar from the beginning of the gill-opening below running low along the sides of the abdomen to the last vertical stripe; a black spot on upper and lower sides of caudal peduncle. Length $8\frac{3}{4}$ inches. Here described from specimens from Okinawa.

Pacific Ocean; very abundant about rocky islands from New Zealand and Australia to the rocky headlands of Japan. Our specimens from Okinawa (adult) and Misaki (young). The Polynesian species, extending to the Revillagigedo Islands, and described as *Teuthis triostegus* by Jordan and Evermann, is a distinct form, *Teuthis sandwichensis* (Streets).

(triostegus, τρετς, three; στέγω, to cover.)

21. TEUTHIS ARGENTEUS (Quoy and Gaimard).

Acanthurus argenteus Quoy and Gaimard, Voy. Uranie, Zool., 1824, p. 372, pl. xliii, fig. 2; Sandwich Islands, Mariannes.—Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 239.

Acronurus argenteus Günther, Cat. Fish., III, 1861, p. 346; Ascension Island.

?*Acanthurus fuliginosus* Lesson, Voyage Coquélle, 1824, p. 149, pl. xxvii, fig. 2.

?*Acanthurus matoides* Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 204; Oualan (Longest dorsal spine $3\frac{1}{2}$ in depth of body).—Günther, Cat. Fish., III, 1861, p. 331; Amboyna, Pinang, Fiji.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 37; Oshima (near Misaki).

Acanthurus annularis Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 209; Ile de France.

Acanthurus blochi Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 209; Ile de France, Seychelles.—Günther, Fische Sudsee, I, 1873, p. 109, pl. lxix, fig. 6; Caroline Islands, Seychelles, Society Islands, Samoan Islands, Palm Island, Kingsmill Islands.

Acanthurus xanthopterus Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 215; Seychelles.—Cantor, Cat. Malayan Fish., 1850, p. 209, pl. iv; Malayan Archipelago.

?*Acanthurus lamarrii* Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 236; Ile de France (Anal rays III, 23.)

Acanthurus melanurus Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 240; Pondicherry.

Acronurus melanurus Günther, Cat. Fish., III, 1861, p. 346; Borneo.

Head $3\frac{1}{3}$; depth $1\frac{2}{3}$. D. IX, 26; A. III, 24; snout $1\frac{3}{6}$ in head; eye $3\frac{1}{3}$; pectoral equal to head; caudal one-fifth longer than head; longest dorsal spine equaling longest soft ray, $1\frac{1}{2}$ in head; ventral long, $1\frac{1}{6}$ in head. Body deep and compressed, the anterior profile steep, convex before eye; caudal lunate, the upper ray one-third longer than middle one. Body slaty brown, mottled with gray, but without bands; dorsal with a bluish gray streak at base, then a bronze one, forking on soft dorsal, inclosing a bluish gray streak; 5 gray streaks and 4 bronze ones on dorsal more or less distinct, especially in young; anal with 5 bluish gray and 5 bronze streaks more oblique than those on the dorsal, and

hence not continuous the whole length of fin; caudal peduncle black, a whitish yellow cross-band behind spine, faint in adult, the anterior margin vertical, the posterior concave; rest of caudal black; pectoral yellowish; ventrals dusky, the spine black. All the marks very faint and often fading in alcohol. Adult with the pectoral quite yellow; pale band at base of caudal, growing faint with age; a blue streak along base of dorsal. Length $4\frac{3}{16}$ inches. Rocky shores throughout the Indian region from the Red Sea to the Hawaiian Islands, everywhere very common, occasionally northward to the projecting headlands of Japan. We have one adult example, described above, from Nafa, in Okinawa. Another adult is from Umesawa, and a young specimen from tide pools at Misaki. The species is very close to *Teuthis crestonis* of the west coast of Misaki, and to *Teuthis bahianus* of the West Indies. Much of the synonymy of this species is very hypothetical. The oldest name applying to the species beyond a doubt is that of *Acanthurus annularis*. But there is scarcely any doubt as to *A. matoides*, and *A. annularis* is apparently the young of the same species. The Hawaiian fish should therefore stand as *Teuthis argenteus*. The Japanese form is apparently not different.

(*argenteus*, silvery.)

22. TEUTHIS BIPUNCTATUS (Günther).

?? *Acanthurus nigroris* CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 1835, p. 208; Sandwich Islands.

Acanthurus bipunctatus GÜNTHER, Cat. Fish., III, 1861, p. 331; China, Fiji.

Teuthis bipunctatus JORDAN and EVERMANN, Proc. U. S. Nat. Mus., XXV, 1902, p. 358; Formosa.

Acanthurus nigros GÜNTHER, Cat. Fish., III, 1861, p. 332; New Hebrides.—ISHIKAWA, Prel. Cat., 1897, p. 34; Miyakoshima.

Head $3\frac{1}{3}$; depth 2. D. IX–25; A. III–23, P. I–16; V. I–5. Body long, compressed, and covered with very small ctenoid scales. Head long, convex above the eyes; eyes high, $2\frac{2}{3}$ in snout, 4 in head, and $1\frac{1}{2}$ in interorbital space; snout slightly produced, $1\frac{1}{2}$ in pectoral, and nearly straight above; head equal to the pectoral; interorbital space strongly convex above; nostrils directly in front of the eye, the anterior rounded and the posterior a small slit. Gill-opening equal to the snout; gill rakers very small, short, and few. Origin of the dorsal over that of the pectoral, the spinous part graduated to the middle and then about equal to the rest of the fin, which ends in a point; the spinous anal graduated to the third spine, which is the longest, and not as high as the highest soft rays; soft anal oblong, ending in a point posteriorly; pectoral longer than head; ventrals equal to the snout with the eye; caudal lunate, the upper lobes pointed. Caudal peduncle compressed, rather deep, and $2\frac{1}{2}$ in the head. Caudal spine sharp, depressable in a groove, and about 2 in the snout. Lateral line concurrent with the back to the caudal spine. Color in alcohol dark chocolate brown, and with the edge of the caudal narrowly margined with white, a black

spot at the base of the last soft dorsal rays on the caudal peduncle above and a similar one at the base of the last anal rays below; edge of the groove of the caudal spine black; lips black, outer portion of the ventral rays blackish. Length $6\frac{3}{16}$ inches. Here described from a specimen from Kotosho, Formosa.

This species is found in the Riukiu Islands, a specimen being in the Imperial Museum from Miyakoshima. We have also two specimens from Kotosho, Formosa, and of this or some closely related species from Hawaii. The species may be known by the black blotch in the axils of the dorsal and anal, in connection with the uniform blackish coloration. In the description of *Acanthurus nigroris* no mention is made of this very conspicuous character. It is not likely therefore that Valenciennes's fish belonged to the present species.

(*bipunctatus*, two-spotted.)

13. ZEBRASOMA Swainson.

Zebrasoma SWAINSON, Nat. Hist. Anim., II, 1839, p. 256 (*velifer*).
Scopas KNER, Novara Fische, 1865, p. 212 (*scopas*).

This genus differs from *Teuthis* in the short spinous dorsal of 4 or 5 graduated spines; soft dorsal high; snout short, projecting at an angle. Asiatic seas.

(zebra, σῶμα, body, from the cross-bands of the typical species.)

23. ZEBRASOMA FLAVESCENS (Bennett).

Acanthurus flavescens BENNETT, Zool. Journal, IV, 1828, p. 40 (yellow form).
Acanthurus flavescens GÜNTHER, Fische Sudsee, I, 1873, p. 116, pl. LXXVI; Tahiti (probably not of Bennett).
Acanthurus rhombeus KITTLITZ, Mus. Senckenberg, I, 1834, p. 196, pl. XIII, fig. 16.
Acanthurus scopas CUVIER and VALENCIENNES, Hist. Poiss., X, 1835, p. 245, pl. CCXC; Ile de France, Ulea.—BLEEKER, Natur. Tydschr. Nederl. Ind., 1851, p. 348.—GUICHENOT, Sagra Hist. Cuba, 1851, p. 122 (Cuba by error).—GÜNTHER, Cat. Fish, III, 1861, p. 342; Ceram, Sandwich Islands, Aneitum.
Acanthurus altivelis CUVIER and VALENCIENNES, Hist. Poiss., X, 1835, p. 249; Ile de France.

Head $3\frac{1}{4}$; depth $1\frac{2}{3}$. D. V–24; A. III, 19; P. I–14; V. I, 5. Body deep, compressed, and covered with minute rough scales. Head long, oblique; snout much produced, very concave above; eye high, $3\frac{1}{2}$ in the snout, $4\frac{1}{2}$ in the head, and $1\frac{2}{5}$ in the interorbital space; nostrils small, close together, directly in front and below the middle of the eye; interorbital space flat, bones on top and sides of head, except the cheeks, striated; mouth small, lips thin; teeth with denticulate edges. Gill-opening short, almost as long as the snout; gill rakers few and very short. Origin of dorsal over that of pectoral, and just a trifle behind the eye; spinous dorsal graduated to the last spine, which is the longest, though not equal to the longest rays, and covered for the most part with rather thick skin; soft dorsal rounded to the last rays, which are the shortest; anal graduated to the third spine, which is the

longest, covered with thick skin, and not equal to the highest anal rays which are about the middle of the fin; pectoral much longer than the head; ventral below pectoral and equal to two-thirds its length; caudal slightly convex, the corners sharp. Space before spine on the caudal peduncle covered with a tract of short, stiff, bristle-like spines. Caudal spine sharp, strong, and equal to the eye. Caudal peduncle compressed, not thick, and 3 in the head. Color pale brown (sometimes bright lemon yellow), a silvery streak from gill-opening above pectorals on the sides. Length $7\frac{5}{16}$ inches. Described from an example from Okinawa of the brown variety called *Zebrasoma rhombeum*.

Of this species we have received one specimen, typical of *Acanthurus scopas*, from Nafa in Okinawa, where it was collected by Yonekichi Koneyama.

The form known as *Zebrasoma flavescens*, bright lemon yellow in color, found at Hawaii, is considered by Dr. Günther as an albino form of *Zebrasoma rhombeum*. On comparison of our specimen with those from Hawaii, we find no difference whatever except in color. Probably the typical *flavescens* is found in deep water, the variety *rhombeum* living near the shore. Such variations from brown to yellow are found in *Siganus*, *Pelor*, *Antennarius*, and other genera.

(*flavescens*, growing yellow.)

14. XESURUS Jordan and Evermann.

Xesurus Jordan and Evermann, Check-list Fishes, 1896, p. 421 (*punctatus*).

Teeth in 1 row, each 5-lobed; caudal peduncle armed with 3 or 4 large bony plates, placed in a right line, each one with a bluntish, non-serrated keel. Ventral rays I, 5. Dorsal with 8 or 9 spines; anal with 3. This genus is close to *Prionurus* Lacépède, differing chiefly in the character of the caudal armature, the plates in *Prionurus* being small, sharper, serrated, and 6 in number, besides a smaller plate below and one above.

(ξέσις, scraping; οὐρά, tail.)

24. XESURUS SCALPRUM (Cuvier and Valenciennes).

NIZA, NISADAI.

Acanthurus scalprum Langsdorf, Ms.

Prionurus scalprum Cuvier and Valenciennes, Hist. Poiss., X, 1835, p. 298; Japan.—Schlegel, Fauna Japonica, 1847, p. 129, pl. lxx; Nagasaki.—Günther, Cat. Fish, III, 1861, p. 347; Japan.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 38; Tokyo.—Nystrom, Svensk, Vet. Handl., 1887, p. 37; Nagasaki.—Ishikawa, Prel. Cat., 1897, p. 34; Boshu.—Jordan and Snyder, Check-List, 1901, p. 91; Yokohama.

Naseus scalprum Bleeker, Act. Soc. Sci. Indo. Nederl., VIII, Japan, VI, 1860, p. 79; Nagasaki.

Etroplus[1] *fumosus* Brevoort, Exped. Japan, 1856, p. 264, pl. vi, fig. 1; Nafa, Riu kiu Islands (Young called *Sumikakuwo*, soot-fish).

[1] This name has been misquoted "*Etsgilus*," but *Etsgilus* is a misprint and does not occur in Brevoort's paper.

Head $3\frac{1}{2}$; depth 2. D. IX–22; A. III–21 or 23; P. I–16; V. I–5. Body elliptical and compressed, skin fine velvety. Head small, longer than deep; eye high, 4 in head, $2\frac{2}{3}$ in the snout and $1\frac{1}{2}$ in interorbital space; snout concave, produced, but the upper profile of the head convex over the eyes; mouth small, terminal, and below the middle of the head; teeth with denticulate margins, the jaws subequal; anterior nostrils below the middle, and half the eye from its anterior margin, and the posterior a nearly horizontal slit between; interorbital space convexly flattened; angle of preoperculum very obtuse. Gill-opening very oblique, gill rakers short. Spinous dorsal more or less embedded in skin, its origin over that of the pectoral, the middle and last spines the highest, and much longer than the soft dorsal rays, which become gradually smaller to the last; anal spines graduated to the third, which is the longest though not as long as the longest anterior rays of the soft anal; the soft anal is similar to the soft dorsal; pectoral smaller than the head; origin of dorsal below the fifth dorsal spine, extending to the base of the second anal spine, and equal to two-thirds the length of the pectorals; caudal emarginate, the lobes pointed. Caudal peduncle rather thick, deeper than broad, and not quite equal to the eye. Sides of caudal peduncle with a single series of 4 bony bucklers, each with a produced median keel, compressed, extending outward, and largest on the last. Lateral line high, arched, and concurrent with the back. General color dusky brown in alcohol, the bases of the first 3 bucklers on the caudal peduncle blackish brown; the edges of the fins dark, except the very narrow white edge of the caudal, otherwise plain. Total length $9\frac{1}{8}$ inches.

Here described from Nagasaki specimens. In very young specimens from Misaki the body is very deep; the depth $1\frac{3}{5}$ the length; the highest part of the fin rays very high; the general color dark livid brown; dorsal and anal very dark, the soft fins broadly edged with white; caudal and caudal peduncle light, shaded with dark at its base; pectorals dark; skin smooth. In still smaller specimens the body is deeper, $1\frac{1}{2}$ in the length, the second dorsal spine as long as the pectoral and very much higher than the rest of the fin, and the body furnished with many vertical striæ; the trunk marked with narrow vertical bands.

This fish is rather common about rocky headlands in southern Japan. Our specimens are from Tokyo, Misaki, and Wakanoura. From the tide pools of Misaki we have a very large series showing the stages of growth of the young. These are more or less yellowish in color, the fins, except caudal and pectoral, dusky. The caudal is yellow, with a black crossbar at its base.

The species can be known from the young of other *Acanthuridæ* by the number of its ventral rays, anal spines, and the soft rays of its dorsal and anal.

(*scalprum*, a sharp knife.)

15. ACANTHURUS Forskål.

Acanthurus FORSKÅL, Descr. Anim., 1775, p. 59 (*unicornis*).
Monoceros SCHNEIDER, Syst. Ichth., 1801, p. 186 (*biaculeatus*).
Naso LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 106 (*fronticornis*).
Nasonus RAFINESQUE, Anal. Nature, 1815, substitute for *Naso*.
Priodon (Cuvier) QUOY and GAIMARD, Voy. Uranie, Zool., 1824, p. 377 (*annulatus*).
Naseus CUVIER, Règne Animal, 2d ed., II, 1829, p. 224 (*fronticornis*).
Priodontichthys BONAPARTE, Destrib. Metod. Anim. Vest., 1833, p. 34 (*annulatus*).
Keris[1] CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 1835, p. 304 (*anginosus*).

Body oblong, compressed, covered with small roughish scales; tail with two large immovable, bony keeled plates, these entirely wanting in young examples. Head in the adult with the forehead prominent, developing a very long bony horn above the eyes, the horn wanting in the young; teeth small in one series, slightly compressed incisors, usually with serrate edges. Ventral fins incomplete, the rays I, 3. Dorsal with 5 or 6 spines; anal with 2 spines, the small first spine wanting. Intestinal canal elongate. Herbivorous fishes of the East Indian and Polynesian seas, some of them remarkable for the bony frontal projection, and for the large ornate caudal spines.

We separate from *Acanthurus* the genera called *Callicanthus*[2] and *Axinurus*[3] (*thynnoides*). The three groups may be provisionally defined as follows:

a. Forehead with an elongate, tapering, subcylindrical horn in the adult; tail with two bony plates; teeth small, serrulate..... *Acanthurus.*
aa. Forehead without subcylindrical horn; the snout with or without a compressed crest.
  b. Tail with two bony plates; dorsal spines 5 or 6; teeth serrulate.. *Callicanthus.*[2]
  bb. Tail with one bony plate; dorsal spines 4; teeth entire..... *Axinurus.*[3]

It seems to us that the generic name *Acanthurus* is available for the genus rather than the later name, *Monoceros*. The genus *Acanthurus* as founded by Forskål includes this genus and *Teuthis*. The first species named by Forskål, *unicornis* being taken as its type, *Acanthurus* becomes equivalent to *Monoceros*. If we follow the rule of allowing subsequent authors to fix the type, *Acanthurus* becomes, of course, a synonym of *Teuthis*, and the present genus must be called *Monocerus*.

(ἄκανθα, spine; οὐρά, tail.)

[1] The definition of the supposed genus *Keris* applies to the young of *Nesurus*. (Ventral rays I, 5; anal spines 3.) But the figure of *Keris anginosus* does not support the description, and the number of fin rays shows it to be the young of some *Acanthurus*.

[2] *Callicanthus* Swainson, Class. Fishes, II, 1839, p. 256 (*elegans*).

[3] *Axinurus* Cuvier and Valenciennes, Hist. Poiss., X, 1835, p. 225 (*thynnoides*).

25. ACANTHURUS UNICORNIS (Forskål).

TENGUHAGI (LONG NOSED SCRAPER) IKKAKUHAGI (ACUTE ANGLE SCRAPER).

Chætodon unicornis FORSKÅL, Descr. Anim., 1775, p. 63; Red Sea.

Aspisurus unicornis RÜPPELL, Atlas Fische, 1828, p. 60; Red Sea.

Naseus unicornis GÜNTHER, Cat. Fish, III, 1861, p. 348; Frankland I., Red Sea, Aneitum, Ceylon.

Monoceros unicornis JORDAN and SNYDER, Check-List, 1901, p. 91; Misaki.

Monoceros biaculeatus SCHNEIDER, Syst. Ichthy., 1801, p. 180, pl. XLII (after Forskål).

Monoceros raii SCHNEIDER, Syst. Ichth., 1801, p. 181 (after *Monoceros piscis* Willoughby).

Naso fronticornis LACÉPÈDE, Hist. Poiss., III, 1802, p. 105, pl. XII, fig. 2; Ile de France.

Naseus fronticornis CUVIER and VALENCIENNES, Hist. Poiss., X, 1835, p. 259; Ile de France, Waigiou, Guam, Sandwich Islands, Red Sea, Otaiti.—SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 129, pl. XIX; Nagasaki.

?Keris anginosus CUVIER and VALENCIENNES, Hist. Poiss., X, 1835, p. 304; no locality; D. VII, 26; A. III, 28; V. I, 5.

Naseus longicornis CUVIER, Guérin, Icon. Poiss., 1830–44, pl. XXXV, fig. 3; Ile de France.

Herspurus monoceros FORSTER, Descr. Anim., Ed. Licht., 1844, p. 219.

Acronurus ægyptius GRONOW, Syst., Ed. Gray, 1854, p. 191; Red Sea (after Hasselquist).

Acronurus corniger GRONOW, Syst., Ed. Gray, 1854, p. 192; Red Sea (after Forskål).

Head 4; depth $2\frac{1}{3}$. D. V-29; A. II-28; P. I-17; V. I-3. Body ovate, deep in front, compressed and fine, velvety, becoming rough in front of the caudal. Head long, the forehead with a long, produced horn, directed forward from the upper part of the eye; snout long, with the upper profile straight, long; eye 3 in the frontal spine, 4 in snout, and $5\frac{1}{2}$ in head; mouth small, the snout produced; nostrils one-half an eye diameter in front of eye and about level with its middle; gill-opening very long, longer than the snout. Origin of the dorsal over the gill-opening, behind the spines shorter than the longer rays, the edge straight and ending in a point; anal spines short, the rays equal, the edge straight and ending in a point; pectorals in front of the dorsal equal to the frontal spine; ventrals in front of the pectorals, the spines sharp and thick, $1\frac{3}{4}$ in snout; caudal compressed, the margin straight and the lobes produced into long filaments. Sides of caudal peduncle with two large compressed bucklers hooked forward. Lateral line very high and concurrent with the back. Color (dried) plain brown. Here described from a large dried specimen from Nagasaki. In the young, known by the number of the fin rays, the bony horn is wanting, and in the very young there is no trace of caudal plates. Specimens from Honolulu seem to agree perfectly with the one from Nagasaki.

This species, very abundant and widely diffused through the Indian

region and Polynesia, is rare in Japan, the adult only taken in the southern islands, the young extending in the Kuro Shiwo, to the rock pools as far north as Tokio. In our collection is one very large specimen from Nagasaki, a smaller one from Kiusiu, and a still smaller one from Misaki. This latter has no frontal spine and no caudal plates. This species is subject to very great variation with age. A very large example from Misaki is in the Imperial Museum at Tokyo.

(*unicornis*, one-horned.)

Family VII. SIGANIDÆ.

Body oblong, compressed, covered with very small cycloid scales; lateral line continuous; tail unarmed. Mouth small, with a single series of serrated trenchant incisors in the jaws; no teeth on vomer or palatines. Pseudobranchiæ well developed. Gill-membranes not united; attached to the isthmus; branchiostegals 5. A single dorsal fin, its rays XIII, 10, the spines strong; anal rays VII, 9, the spines well developed. Ventral fins thoracic, each with an outer and an inner spine, and three soft rays between them. Caudal fin cunate. Air bladder large, forked before and behind. Intestinal canal with several convolutions; pyloric cæca 5 or 6. Vertebræ 10 + 13 = 23. Skeleton showing many peculiarities, the maxillary and premaxillary firmly united, the lower pharyngeals very little developed. Herbivorous fishes of the East Indian seas, all belonging to the single genus *Siganus*. The family is of uncertain affinities, and shows numerous peculiarities not found in related forms. It is probably nearest the *Acanthuridæ*.

16. SIGANUS Forskål.

Siganus FORSKÅL, Descr. Anim., X, 1775, p. 26 (*siganus-rivulatus*).
Centrogaster HOUTTUYN, Acta Soc. Harlem, V, 1782, pp. 20, 333 (*fuscescens*).
Amphacanthus SCHNEIDER, Syst. Ichth., 1801, p. 206.
Teuthis CANTOR, Cat. Malayan Fishes, 1850, p. 207 (*javus*, and of numerous authors, not of Linnæus).

The characters of the genus are included above.

(*Sidjan* or *Sigian*, the Arabian name of *Siganus siganus*.)

a. Color brown, gray, or yellow, usually with very numerous round, whitish spots ..... *fuscescens*, 26.

aa. Color yellow, with oblique blue bands and streaks, distinct about the head. *virgatus*, 27.

26. SIGANUS FUSCESCENS (Houttuyn).

AIGO (BLUE THING); GINHAGI (SILVERY SCRAPER); KIZINOUWO (PHEASANT FISH).

Centrogaster fuscescens HOUTTUYN, Act. Soc. Harl., XX, 1782, p. 333; Nagasaki.
Amphacanthus fuscescens CUVIER and VALENCENNES, Hist. Poiss., X, 1835, p. 156; Japan.—SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 127, pl. LXVIII, fig. 1, Nagasaki.—BLEEKER, Verh. Bat. Gen., XXVI, Japan, 1857, p. 106; Nagasaki.

Teuthis fuscescens Günther, Cat. Fish, III, 1861, p. 321 (copied).—Steindachner and Döderlein, Fische Japans, III, 1884, p. 25; Tokyo.

Theutis fuscescens Nystrom, Svensk, Nat. Handl., 1887, p. 37; Nagasaki.

Siganus fuscescens Jordan and Snyder, Check-List, 1901, p. 92; Yokohama.

Amphacanthus albopunctatus Schlegel, Fauna Japon, Poiss., 1847, p. 128; Nagasaki.

Teuthis albopunctata Günther, Cat. Fish, III, 1861, p. 318; Amoy, Philippines.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 25; Kagoshima.—Ishikawa, Prel. Cat., 1897, p. 34; Tokyo.

Amphacanthus aurantiacus Schlegel, Fauna Japonica, 1847, p. 128; Nagasaki.

Amphacanthus margaritiferus Richardson, Ichth. China, 1846, p. 243; Canton (not of Cuvier and Valenciennes).

Teuthis brevirostris Gronow, Syst., Ed. Gray, 1854, p. 142; Indies.

Head $3\frac{2}{3}$ to $4\frac{2}{5}$; depth $2\frac{1}{2}$ to $2\frac{3}{4}$. D. I–XIII or XIV–10; A. VII–9; P. I–14 to 16; V. I–3–I. Body compressed, oblong, and covered with very small round scales. Head small, the profile concave above in front of the dorsal; eye moderate, not high, $3\frac{3}{4}$ in the head, $1\frac{1}{2}$ in the snout, and $1\frac{1}{2}$ in the interorbital space; snout convex above, very blunt and rounded, mouth inferior, the mandible not projecting, with the lower jaw fitting under the upper; maxillary expanded distally, its breadth at this point 4 in the snout, and not reaching as far posteriorly as the second nostril; nostrils level with the upper part of the eye, the first pair a little less than an eye diameter from the anterior margin of the eye, and the second a little nearer the first than the eye; teeth small and pointed; lips rather broad and thin; interorbital space convex. Gill-opening semicircular, moderate, and the membrane adnate to the isthmus. First spine of dorsal low, short, and directed forward, the rest of the spinous part of the fin occupying the greater part of the back, the spines shorter posteriorly; soft dorsal not as high as, and its base 3 in that of the spinous dorsal; anal midway between the tip of the snout and the base of the caudal, the middle spines the longest and the base of the spinous portion longer than the base of the soft rays; soft dorsal highest in front; pectoral $1\frac{2}{5}$ in the head, rounded; ventral a little behind the gill-opening, equal to two-thirds the space between their own tips and the origin of the anal; caudal lunate, the edges pointed. Caudal peduncle deeper than broad, though not quite equal to the eye. Anus between the ventrals posteriorly. Lateral line high, and concurrent with the back. Color in spirits rich chocolate-brown above, below silvery white; above and on the sides darker, marbled and mottled with darker; fins dark brown, marbled with darker, the pectoral and a bar on the caudal blackish. Here described from a specimen from Tokyo, $11\frac{3}{4}$ inches long. Smaller examples differ in color as follows:—Body covered with numerous small, round, light spots; caudal edged narrowly with light color like the back; fins blotched with light color, and a large dark-brown spot as large as the eye behind the opercle above.

This species is very common about rocky islands in the warm bays

of southern Japan. Our specimens of various ages were obtained at Tokyo, Yokohama, Misaki, Wakanoura, Kobe, Onomichi, Hakata, Kawatana, and Nagasaki.

We are unable to distinguish more than one species among all our Japanese specimens. All show the small white spots characteristic of *albopunctatus*. It is probable that *fuscescens* represents a very dark specimen like some of ours from Tokyo Bay in which the spots are very obscure. Those called *aurantiacus* represent an orange-colored variation probably found in examples from deeper waters. *Siganus oramin*, of India, seems to be somewhat different. having the spots larger and sparser and the caudal banded.

(*fuscescens*, dusky.)

27. SIGANUS VIRGATUS (Cuvier and Valenciennes).

Amphacanthus virgatus CUVIER and VALENCIENNES, Hist. Poiss., X, 1835, p. 133; Java.

Teuthis virgata GÜNTHER, Cat. Fish., III, 1861, p. 323; China, Philippines.—ISHIKAWA, Prel. Cat. 1897, p. 34; Miyakoshima.

D. XIII–10; A. VII–9; Cæc. pylor. 4. Body light brownish-yellow, forehead and neck with bluish transverse stripes; an oblique, deep brown, blue-edged band descends from the fourth and sixth dorsal spines to the root of the pectoral; a second similar band from the origin of the dorsal to the orbit; the space between the two bands is yellow; scattered blue dots on the upper parts of the body; some oblique bluish streaks on the snout.

(Description after Cuvier, Valenciennes, Günther.)

Of this East Indian species one specimen from Miyakoshima is preserved in the Imperial Museum at Tokyo.

(*virgatus*, streaked.)

SUMMARY.

Family I. ZEIDÆ.

1. *Zenopsis* Gill.

1. *nebulosa* (Schlegel); Tokyo, Misaki.

2. *Zeus* Linnæus.

2. *japonicus* Cuvier and Valenciennes, Tokyo, Misaki, Kobe, Hiroshima, Suruga, Nagasaki.

3. *Cyttopsis* Gill.

3. *itea* Jordan and Fowler; Suruga Bay.

Family II. ANTIGONIIDÆ.

4. *Antigonia* Lowe.

4. *steindachneri* Jordan and Evermann; Hilo, Kailua, Honolulu.
5. *rubescens* (Günther); Totomi Bay, Misaki, Suruga Bay.

Family III. PLATACIDÆ.

5. *Platax* Cuvier.

6. *teira* (Forskål); Formosa, Kezen, Riukiu, Bonin Islands, Tokyo, Punjako (near Morioka).

Family IV. CHÆTODONTIDÆ.

6. *Chætodon* (Artedi) Linnæus.

7. *setifer* Bloch; Nafa, Okinawa.
8. *vagabundus* Linnæus; Nafa, Okinawa.
9. *collaris* Bloch; Ikune, Satsuma.
10. *modestus* Schlegel; Misaki.
11. *nippon* Döderlein; Totomi Bay, Misaki, Tokyo.
12. *dædalma* Jordan and Fowler; Nafa, Okinawa.

7. *Coradion* Kaup.

13. *desmotes* Jordan and Fowler; Nagasaki.

8. *Microcanthus* Swainson.

14. *strigatus* (Cuvier and Valenciennes); Tokyo, Misaki, Nagasaki.

9. *Heniochus* Cuvier and Valenciennes.

15. *macrolepidotus* (Linnæus); Wakanoura, Nagasaki.

10. *Holacanthus* Lacépède.

16. *septentrionalis* Schlegel; Ikune.
17. *ronin* Jordan and Fowler; Misaki, Wakanoura.
18. *tibicen* Cuvier and Valenciennes; Nafa, Okinawa.

Family V. ZANCLIDÆ.

11. *Zanclus* Cuvier and Valenciennes.

19. *canescens* (Linnæus); Misaki.

Family VI. ACANTHURIDÆ.

12. *Teuthis* Linnæus.

20. *triostegus* (Linnæus); Okinawa, Misaki.
21. *argenteus* (Quoy and Gaimard); Nafa, Umesawa, Misaki.
22. *bipunctatus* (Günther); Kotosho, Formosa.

13. *Zebrasoma* Swainson.

23. *flavescens* (Bennett); Nafa, Okinawa.

14. *Xesurus* Jordan and Evermann.

24. *scalprum* (Cuvier and Valenciennes); Tokyo, Misaki, Wakanoura.

15. *Acanthurus* Forskål.

25. *unicornis* (Forskål); Misaki, Nagasaki.

Family VII. SIGANIDÆ.

16. *Siganus* Forskål.

26. *fuscescens* (Houttuyn); Tokyo, Yokohama, Misaki, Wakanoura, Kobe, Onomichi, Hakata, Kawatana, Nagasaki.
27. *virgatus* (Cuvier and Valenciennes).